TECHNICAL MANAGER'S REPORT

Joint Recovery and Distribution System (JRaDS) Joint Capability Technology Demonstration (JCTD)

GOVERNMENT PARTNERS:

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This report?s purpose is to provide a concise unclassified JRaDS JCTD program review from the Technical Manager's (TM's) perspective. This report will summarize program activities and lessons learned that can be shared with other similar programs. Most referenced documents hold For Official Use Only designation and while they can be requested for viewing, they are not authorized for public release. The JRaDS program objectives were to demonstrate and evaluate the JRaDS trailers with Joint users, to fill the identified Army and Marine operational gaps, and to provide sufficient data to aide combat developers at the Combined Arms Support Command (CASCOM) in the preparation of a Capabilities Development Document (CDD) for the Future Force Family of Trailers (F3T).

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Joint Capability Technology Demonstration (JCTD)

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JOINT RECOVERY and DISTRIBUTION SYSTEM (JRaDS) JOINT CAPABILITY TECHNOLOGY DEMONSTRATION (JCTD)

EXECUTIVE SUMMARY:

This report's purpose is to provide a concise unclassified JRaDS JCTD program review from the Technical Manager's (TM's) perspective. This report will summarize program activities and lessons learned that can be shared with other similar programs. Most referenced documents hold For Official Use Only designation and while they can be requested for viewing, they are not authorized for public release.

The JRaDS program objectives were to demonstrate and evaluate the JRaDS trailers with Joint users, to fill the identified Army and Marine operational gaps, and to provide sufficient data to aide combat developers at the Combined Arms Support Command (CASCOM) in the preparation of a Capabilities Development Document (CDD) for the Future Force Family of Trailers (F3T).

The JRaDS family of trailer systems was a Fiscal Year 2009 JCTD program that explored emerging technologies to support distribution and recovery of equipment during Joint deployment, sustainment and recovery/retrograde operations. The program's execution followed an accelerated process of requirements validation, acquisition, manufacturing, testing, and technical and operational demonstrations with the U.S. Army, the United States Marine Corps (USMC), and the U.S. Air Force. An Independent Assessor evaluated The Operational Demonstrations. An official "MEMORANDUM FOR DEPUTY UNDER SECRETARY OF DEFENSE, RAPID FIELDING" was issued by United States Transportation Command (TRANSCOM) confirming favorable findings (see page V of this report.) In short, JRaDS proved that it can enable the Department of Defense (DoD) with the following capabilities:

- Multiple mission profile execution through a smaller number of trailer types;
- Self loading and self-off loading of various rolling stock and cargo (such as Army Containerized Roll-in/Out Platforms (CROPs)), and demountable International Organization for Standardization-(ISO)-compatible cargo beds (flatracks) from the ground or any other level surface up to C-5 elevation.) This capability promises to enhance distribution and reduce the need for Material Handling Equipment (MHE) at the tactical and operational levels;
- Loading of 463L pallets into strategic and tactical airlift aircraft quickly through the use of a Cargo Handling Deck (CHD);
- Efficient recovery capability of catastrophically disabled Tactical Wheeled Vehicles (TWVs), including Mine-Resistant Ambush-Protected (MRAP) vehicles up to Category III and Aircraft up to trailer payload without external material handling equipment;
- Modular design and use of common parts, to reduce service logistics, maintenance requirements, and other ownership costs;
- Superior off-road mobility providing improved deployment and sustainment delivery;
- Tilt bed design (trailer stays connected to the prime mover) allowing for rapid loading and transport of engineer equipment.

The JRaDS concept also promises overall energy usage reduction as the functions normally performed by several systems can be performed with fewer systems and warfighters. Fewer assets and warfighters involved in performing missions reduce our warfighters' exposure to enemy fire. Due to their superior off-road mobility, JRaDS trailers can travel across rough terrain where current trailers cannot.

The TM's opinion is that, based on demonstration results extrapolated over the known and observed missions, JRaDS' approach could lead to as few as five variants in the F3T. The F3T Systems can differ by the amount of payload they can carry and the mission equipment and options, such as a crane, a roller deck, or winches.

Of the eight Boeing-manufactured JRaDS residual trailers, four 40-ton variant trailers (40T) (National Stock Number (NSN): 2330-01-590-0423, NSLIN: YF203N), are deployed to Afghanistan in support of *Operation Enduring Freedom (OEF)* and four 34-ton variant trailers (34T) (NSN: 2330-01-597-3592, PCCN: CJRAD2/2330-01-597-3592) are stateside, transitioned to the Michigan, Mississippi and California National Guard. The two Tactical Intermodal Logistics Trailer (TILT) trailers manufactured by Utility Tool and Trailer, which were under JRaDS, were transferred to support Michigan National Guard. The knowledge gained from the multiple operational demonstrations performed with all the JRaDS trailers was shared with CASCOM for inclusion in the F3T CDD.

UNITED STATES TRANSPORTATION COMMAND
508 SCOTT DRIVE
SCOTT AIR FORCE BASE, ILLINOIS 62225-5357

JUL 22 2011

MEMORANDUM FOR DEPUTY UNDER SECRETARY OF DEFENSE, RAPID FIELDING
ATTENTION: MR EARL WYATT

FROM: TCJ5/4D

SUBJECT: Joint Recovery and Distribution System (JRaDS) Joint Capability Technology Demonstration (JCTD) Final Operational Utility Assessment (OUA) Report

Attached is the executive summary of the Independent Assessor's report on the performance of the JRaDS technology during the JCTD. The full report will be posted on Knowledge Information Management System. Overall this critical assessment proves the Operational Utility of the JRaDS technology. We recommend that the department move forward with the fielding of the JRaDS technology.

The JCTD accomplished four major Operational Assessments with Soldiers and Marines, in addition to several technical demonstrations. Lessons were learned and changes to the technology were made during the demonstrations that ultimately improved the technology and Concept of Operations.

Three 40T residual JCTD trailers have been proving themselves in Afghanistan since January with the 101 Sustainment Brigade. The Army is processing an Operational Needs Statement for the remaining four 34T residual trailers for immediate use for theater logistics and recovery. Of all trailers currently fielded in Afghanistan, a Captain in the 101st SUS BDE stated, *"from our prospective the JRaDS has more capability than anything available in a single system..."*

The US Marine Corps is in the process of buying eight customized JRaDS trailers for immediate use in Afghanistan by issuing an Urgent Universal Needs Statement. They made this determination after the OUA at 29 Palms Marine Corps Air Ground Combat Center, CA in February 2011.

Many of the deficiencies noted in the report were corrected as the demonstrations progressed. Soldier and Marine suggestions were implemented during the course of the JCTD. These corrective actions addressed many of the recommended improvements noted in the JRaDS JCTD Final OUA Report. The Army has committed to incorporate JRaDS technologies in the Capabilities Production Document under development for future long term production. JRaDS is a proven and successful gap filler for theater logistics and tactical wheel vehicle recovery solutions impacting the immediate fight and beyond.

BARBARA J. SOTIRIN
SES, DAFC
Deputy Director, Strategy, Policy
Programs and Logistics

Attachment:
JRaDS JCTD Final Report Executive Summary

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Distribution approved for public release, distribution is unlimited (Sept. 19, 2013). Requests for this document shall be referred to Tank Automotive Research, Development and Engineering Center (TARDEC) - 6501 E. 11 Mile Road, Warren, MI 48397-5000.

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2 JRADS JCTD PROGRAM BACKGROUND

2.1 INTRODUCTION

The JRaDS Joint Capability Technology Demonstration (JCTD) developed and demonstrated the military utility of a new family of transportation trailers for the DoD. This JCTD was Joint Requirements Oversight Council (JROC) validated with oversight from the Office of the Under Secretary of Defense, Acquisitions, Technology and Logistics. The JCTD program's purpose is to to rapidly transition the demonstrated capabilities to the warfighter.

The JRaDS JCTD provided a Family of Systems (FoS) that enabled execution of multiple mission profiles via a small number of trailer variants. This FoS promises to offer high reliability and parts commonality; thus reducing service logistics and maintenance requirements and associated life-cycle costs of ownership. Additionally, due to the JRaDS' total-mission-inclusive capability, requirements for supplementary MHE and supporting personnel may be reduced. These capabilities can expedite cargo movement from Sea Ports of Debarkation, Aerial Ports of Debarkation, and Theater Supply Depots to front-line users, while reducing costs associated with movement of cargo within theater. JRaDS will also afford an expeditious and efficient method of recovering disabled and catastrophically damaged TWVs, such as MRAPS, and helicopters. The JRaDS JCTD was also tasked to produce an Aircraft Interface Kit, later referred to as the CHD. The CHD is an enabling kit that allows loaded 463L pallets to be expeditiously loaded to/from C-130, C-17 and C-5 cargo aircraft.

2.2 PROGRAM BACKGROUND

This document serves as the TM's final report for the JRaDS JCTD. The JRaDS JCTD was comprised of three trailer variants: the 34T Line Haul (LH), the 40T Recovery Trailer System (RTS), and the 14T TILT.

TARDEC was selected as the TM to lead this project's technical effort. The TM secured and distributed needed funding, developing the necessary Scopes of Work for contracts, managing those contracts, overseeing testing for the 40T and 34T demonstrator variants, staging and executing technical demonstrations, and supporting operational demonstrations at various sites to assess military utility for the joint DoD user. The collaborative team, besides several TARDEC associates, included armed services members, industry partners, Defense Logistics Agency (DLA), and OSD.

2.3 JCTD

The JCTD program's primary goal is to demonstrate, operationally assess, rapidly deploy, and transition capability solutions and innovative concepts to address the joint, coalition and interagency operational gaps and shortfalls. JCTDs are an excellent vehicle for demonstrating advanced technologies with the warfighter. JCTDs give justification and authority to conduct operational demonstrations with warfighters to get their feedback on the technology as presented. The JCTD process has been tested on many projects since the first technology demonstration started in 1955, then known as Advanced Concept Technology Demonstrations. The JCTD process facilitates the division of labor between several organizations to lead the technical, operational, transition and supervisory roles. The established procedures and protocols help to increase the demonstration process' efficiency. To learn more about JCTDs, please go to : http://www.acq.osd.mil/jctd/

DoD Directive 5134.1, April 21, 2000, states:

> *"Establish policies and programs that improve, streamline, and strengthen DoD Component technology access and development programs, encourage open market competition and technology-driven prototype efforts that offer increased military capabilities at lower total ownership costs and faster fielding times, and exploit the cost-reduction potential of accessing innovative or commercially developed technologies."*

As a JCTD candidate, the JRaDS program was ranked third for Congressional FY09 approval and first for TRANSCOM. Each JCTD program requires three independent partners: the Operational Manager (OM), the TM, and the Transition Manager (XM). The team consisted of TRANSCOM OM, a CASCOM Deputy OM, a TARDEC TM, and a TACOM Program Executive Office (PEO) Combat Support and Combat Service Support (CS &CSS) XM. The Oversight Executive (OE) came from OSD – Rapid Fielding.

2.4 TM'S RESPONSIBILITIES

The TM is responsible for planning, coordinating and directing all technical activities related to the JRaDS JCTD. According to the Practical Operating Guidelines from the OSD/JCTD website, the TM has the following responsibilities:

- Provide day-to-day technical direction
- Serve as member of Integrated Management Team with the OM, XM and OE
- Co-develop Implementation Directive and Management and Transition Plan
- Integrate and technically demonstrate the capability and applicable technologies
- Manage JCTD contract(s) and acquisition instruments
- Deliver the Joint Capability Solution to the OM for demonstration, exercises and assessment
- Participate and contribute to the Operational Utility Assessment (OUA) planning
- Participate and contribute to the Concept of Operations (CONOP) and Techniques, Tactics and Procedures development
- Manage the Capability Solution
- Participate and contribute to transition planning
- Develop training plan and provide training
- Contribute to development of Doctrine, Organization, Training, Materiel, Leadership, Planning and Facilities (DOTMLPF) recommendations
- Continue to support JCTD during Extended Use of interim capability, as needed
- Serve as JCTD financial manager

3 JRADS JCTD PROGRAM REVIEW

3.1 JRADS JCTD TM'S REFERENCE MATERIALS

The JRaDS JCTD program required the participation of many agencies, test facilities, users and contractors. Much work was documented in reports that are required by the JCTD process. Section 14 (References) of this report lists major events, documents of this program, and describes the event's major accomplishments. This report grew as a result of those references and TM's personal involvement and understanding of this JCTD program.

3.2 JRADS JCTD PROGRAM REVIEW SUMMARY

The TM managed all funds provided to the JCTD program, which included the Office of the Secretary of Defense, TRANSCOM, DLA, TARDEC National Automotive Center, PEO CS &CSS, Office of Naval Research, PM MRAP and Joint Program Office (JPO) MRAP offices. The TM organized the research, development, test and evaluation efforts in coordination with the OM and the XM.

The JCTD program was executed according to an accelerated process of requirements' validation, funding requests, preparation of necessary acquisition documentation, contracting, manufacturing, testing, and technical and operational demonstrations with Army, Marines and Air Force. The Operational Demonstrations were evaluated by an Independent Assessor and reported per JCTD program requirements. A "MEMORANDUM FOR DEPUTY UNDER SECRETARY OF DEFENSE, RAPID FIELDING" was issued by TRANSCOM recommending that the Army should "move forward with the fielding of JRaDS technology".

To focus around a common goal with collaboration between the different agencies right from the start, the TM set out to create a JRaDS JCTD logo. The logo signified the team's goal to provide a joint environmentally friendly global solution to the joint warfighters.

The official start date for the JRaDS JCTD was Dec. 5, 2008. Prior to this official start, JPO MRAP contracted for the four 40T RTS trailers. This variant was fully incorporated into the JCTD program upon program initiation through a Statement of Understanding (SOU) signed by the offices on Dec. 8, 2008. The SOU stated that the JPO MRAP office will deliver the 40T JRaDS variant to the JRaDS JCTD team, who will be responsible for the trailers' testing, and all work leading to and through operational demonstrations. This relationship was observed throughout the program's life.

For the remaining JRaDS variants, the TM's first challenge was to obtain and evaluate Operational User Requirements (OURs) as gathered by the combat developers. During Calendar Year 08, CASCOM conducted four Joint User Conferences to discern what is needed in a future family of trailers and obtain the OURs. Since an official requirements document did not exist, the TM team took the raw data from the CASCOM combat developers and analyzed the joint OURs. According to the direction obtained from these 34T OURs, the trailer was envisioned to satisfy multiple missions' needs. The highly sophisticated trailer demonstrator was manufactured to determine what capabilities are desired, which capabilities are excessive, what technologies work well, and what technologies need to be modified in the future DoD family of trailers. The data obtained throughout the JCTD program was then slated to feed CASCOM combat developers in writing the CDD for the future family of trailers. The OUR data was analyzed and the analysis results were combined with the mandatory standards (Department of Transportation, DoD, North Atlantic Treaty Organization, Society of Automotive Engineers) and matched with existing prime mover fleet capabilities to produce a performance objective document used for the 34T JRaDS trailer acquisition.

While program funding was approved in December 2008, the actual money was not received until March 2009. This created the challenge of keeping the contracting offices engaged with only promises of funding

and without an existing contract mechanism. Additionally, the funding was not adequate to meet the program's needs for the first year. As a result, the team was forced to award a contract that accounted for less than half of the known work effort and plan for future contract modifications for the rest of the effort. The contract needed flexibility to allow for these future modifications when the next year's money became available. The acquisition process started with two basic trailers despite knowing that the operational demonstration would require four trailers and knowing that an aircraft cargo loading/offloading kit would be needed, as well as the crane and the mission-specific tools. These additions had to wait for the following year's funding (FY10), which did not actually arrive until April 2010.

While waiting for funding, the TM engaged the expertise of TARDEC-Concepts, Analysis, System Simulation and Integration (CASSI) to prepare an independent government concept design. This concept design was then used by the TACOM Cost and Analysis team to prepare an Independent Government Cost Estimate, which was necessary for proposal analysis. The JRaDS' TM team, integrated with CASSI and its subgroups, gave the team access to a larger, more comprehensive team for greater collaboration. In its later phase, the JRaDS team inquired the help of CASSI–Analytics to perform computer simulations to compare and contrast the advanced suspension system in support of future acquisition to Program of Record (PoR).

The overall JRaDS JCTD team was broad and encompassed members from the joint services, government agencies, and industry. Each contributed to the overall program success; whether the support was through funding, advice, work performed or other effort. The program accomplished its goals and the overall program success went beyond most expectations. The JRaDS JCTD trailers demonstrated their respective capabilities and proved to those that participated in the various and extensive demonstrations that the JRaDS trailers should become a warfighter solution and for humanitarian/disaster-relief efforts. The many technical and operational demonstrations all provided positive feedback, from places such as: APG, MD; Fort Campbell, KY; Fort Leonard Wood, MO; Dover Air Force Base, DE; Twenty-Nine Palms Marine Corps Air Ground Combat Center, CA; Fort Eustis, VA; and recent Afghanistan deployments. These demonstrations and lessons learned have led to design improvements. Many of these design improvements were incorporated into the JRaDS trailers prior to trailer deployment.

The deployed trailers' success was so great that warfighter units attempted to get more than 120 JRaDS trailers through Operational Needs Statements (ONS). The ONS requests were to support ongoing Soldier and Marine tactical vehicle and aircraft recovery operations, logistics support, and sustainability and expeditionary operations that require advanced mobility capabilities. The ONS for the four residual 40Ts was validated and resulted in four JRaDS trailers deployed for Outside Continental United States (OCONUS) operation in *OEF* — Afghanistan. However, all subsequent ONS requests were denied stating that support was available through other means.

3.3 JRADS JCTD PROGRAM OBJECTIVES

The primary JRaDS JCTD program objectives were to demonstrate the JRaDS trailers with users from the Joint Services and evaluate whether the JRaDS-offered capabilities closed the identified Army, Marine and TRANSCOM gaps. The program's additional objective was to provide CASCOM combat developers with all the data generated throughout the JCTD process to help prepare a CDD for the F3T.

The JRaDS trailer's objectives included the following:

- Targeting multiple missions with a small number of trailer variants.
- Self loading, self-off loading, transloading and transporting of containers, pallets, equipment, flatracks and vehicles for the purpose of reducing reliance on MHE and Cargo Handling Equipment (CHE).
- Increasing parts commonality between trailer variants to reduce logistic support.
- Providing improved deployment and sustainment delivery.

- Providing aircraft interface to load and off-load cargo.
- Providing efficient TWV and helicopter recovery.
- Recovering catastrophically damaged MRAP and TWV.
- Rapid engineer equipment loading and transport.
- Proving all the above capabilities with off-road mobility and without the use of additional MHE, CHE or other recovery vehicles.

3.4 JRADS CAPABILITY REQUIREMENTS

CASCOM conducted four joint user conferences during 2008 timeframe to gather joint user requirements for the F3T. These requirements were summarized by TARDEC engineers and the results translated into a Performance Objectives document that was used for JRaDS trailer acquisition. The Performance Objectives document was initially written as a Purchase Description to steer the manufacturer to produce a system that is as close as possible to a future PoR acquisition. The result of this effort produced a matrix of what would be part of the initial system, the JRaDS, and one that can be easily modified during procurement for the final product.

3.5 JRADS DESCRIPTION

The JRaDS JCTD was executed by providing three variants of a new family of trailers. The JRaDS demonstrators directly addressed operational needs and mobility requirements identified by Army and Marine Corps leaders. The system missions include vehicle and helicopter recovery operations, cargo loading and transportation and engineer equipment loading and transportation. Through inter-service research and development partnerships, the JRaDS FoS provides new Joint capabilities for multiple targeted missions, including recovery capabilities for catastrophically damaged MRAP; Stryker; TWVs; and light, medium and heavy rotary aircraft. The JRaDS FoS can also transport engineer equipment and ISO containers and can provide tactical distribution in austere or remote environments without external MHE support.

Below is a quick JRADS variant overview for the 40T, 34T and 14T trailers.

Trailer Type	Overall Length	Deck Length	Deck Width	Deck Width with Outriggers	Payload
40T RTS	58 feet	34.5 feet	102 inches	N/A	80,000 pounds
34T LH	53 feet	40.4 feet	98.4 inches	120 inches	68,000 pounds
14T TILT	27.75 feet	22 feet	96 inches	N/A	28,000 pounds

The three JRaDS variants share several common key capabilities. The 34T and 40T have slideable (fore/aft) bogeys that enable the trailer bed to tilt to the ground. The hydraulic suspension is also able to adjust the trailer bed's height for loading or to allow for a greater suspension travel for off-road mobility. The 34T, with its fully independent suspension, can control the trailer deck's side-to-side tilt (roll degree of freedom) to match with a vehicle/aircraft loading ramp for passing loads on uneven terrain in addition to providing better off-road mobility. The TILT is able to tilt to the ground with a hydraulic system engineered for weight savings, and its ability to produce steep angle was designed for quick off-loading for humanitarian supplies. All three variants have winches. The 34T and 40T have an on-board Auxiliary Power Unit (APU), while the TILT has a mobile power unit that can be used if needed, but primarily depends on using the prime mover's Power Take-Off (PTO). While a crane is equipped on every 40T demonstrator, it is considered an option on the 34T demonstrators. A powered CHD kit (roller deck) is an option on the 34T for direct trans-loading of 463L pallets and other cargo to and from cargo aircraft. (The future design would probably include

a deck design that can easily be converted to a roller deck by flipping the deck panels as opposed to having a kit that is added.) The JCTD built two fully equipped 34Ts with cranes and CHD and two without these options. The following sections detail each trailer variant in more detail.

3.5.1 JRaDS Key Features

Some key features of the JRaDS trailers include the following:

- Meets all DoT regulatory requirements for highway transport.
- Equipped with dual on-board winches for vehicle and equipment on/off-loading.
- Equipped with crane (40T and option on 34T) and optional roller deck (34T).
- Provides support for logistics, distribution, recovery and evacuation missions.
- Maximizes parts commonality across the FoS trailers.
- On- and off-road capable.
- Uses a modular, scalable design to accommodate specific contingency operations.
- Designed for ease of maintenance and operation.
- Interfaces with aircraft for loading and off-loading cargo.
- Repositionable wheels (moveable bogie) maximize its load-bearing capabilities and increase maneuverability and vehicle/equipment transportability.
- JRaDS 40T and 34T trailers interface with all 5th Wheel Army and Marine Corps prime movers, including: Heavy Expanded Mobility Tactical Truck, M983 Light Equipment Transporters (LETs), M916 LETs, Logistics Vehicle Systems, Logistics Vehicle System Replacement (Marine Corps heavy truck), Heavy Equipment Transporters (HET) (40T only), M915 LH Tractors (34T only).
- JRaDS 14T is a pintle-type trailer and is compatible with Family of Medium Tactical Vehicles (FMTV), HEMTT, PLS, MATV and other trucks with pintle-tow capability.
- On-board AC power outlets for electrical hand tools (34T and 40T).
- Integrated (34T and 40T) or Mobile (TILT) on-board APU.
- Equipped with hydraulic-driven anchoring system (provided with 40T).

3.5.2 JRaDS Capabilities

The following JRaDS capabilities were demonstrated and the military utility assessed for DoD's new FOS trailers without the use of MHE:

- Perform multiple missions with a small number of trailer variants designed for increased parts commonality.
- Improve end-to-end theater supply delivery and reduce TWV and aviation recovery effort level; demonstrated in Afghanistan by 101st Sustainment Brigade and other brigades.
- Self loading, self-off loading and transporting containers, pallets, equipment, flatracks and vehicles.
- Aircraft interface capability for cargo handling; 463L pallets and rolling stock were successfully loaded and off-loaded between trailer CHD and the cargo decks of C-130, C-17 and C-5.
- Trailer-based MRAP and TWV Recovery up to 80,000 pounds (CAT III).
- Engineer equipment transport without needing to disconnect trailer from truck for loading purposes
- Aircraft recovery of Apache, Blackhawk, CH-47, C-17.

3.6 40T JRADS TRAILER

The JRaDS 40T variant is a semi-trailer designed to be pulled by various organic military fifth-wheel trucks. Its extended goose neck makes it compatible with the M1070 HET and is the longest of the JRaDS FoS. The JRaDS 40T is rigid and sturdy enough to support an 80,000-pound load and has a hydro-pneumatic suspension designed to travel over off-road terrain. The 40T is equipped with a built-in 99 HP Kubota diesel APU to provide power to operate its electrical and hydraulic systems, including: the tilt-bed, tailgate, landing gear, four 110V AC electrical outlets, crane, and two winches, detailed below. The tilt-bed is equipped with restraints and rigging to secure and evacuate the intended load. The 40T design allows for expeditious recovery of rolled over vehicles by up-righting the vehicles and pulling them onto the 40T deck. The 40T is also capable of loading and moving operational or dead-lined heavy engineer equipment without MHE help and without having to uncouple from its prime mover.

Figure 1: JRaDS 40T with tailgate up.

The 40T is a self-contained recovery semi-trailer designed to support recovery, evacuation and transportation of heavy, catastrophically damaged vehicles up to its 40-ton (80,000 pounds) payload. It is equipped with two 50,000-pound capacity planetary winches (100,000 pounds, when used with the provided light-weight snatch blocks), an 80,000 foot-pounds (ft-lbs) capacity knuckle boom crane, and a hydraulically actuated tailgate that moves independent of the tilt bed in addition to the standard set of JRaDS enabling equipment. The bed, tailgate, bogey and winches are operated either from a single control station on the trailer or by a tethered (100-foot cable) remote control.

Figure 2: JRaDS 40T – Suspension with demonstrated (18 inch) ability to climb a vertical step.

The JRaDS 40T's hydro-pneumatic suspension system causes each axle to share loads equally. Each axle is rated at 30,000 pounds and is equipped with air brakes. Axles 2 and 4 are equipped with an anti-lock braking system (ABS). All 16 wheels are Accuride steel wheels with run flat rings and Michelin 275/70R22.5 XTY2 tires. The repositionable bogie allows the load to be balanced properly between the JRaDS 40T and the prime mover fifth wheel.

The JRaDS 40T has a crane that can pick up break bulk cargo up to 8,000 pounds (including crane attachments) within 10 feet of the crane's centerline (80,000 ft-lbs). Break bulk cargo includes blown-off parts from damaged MRAP vehicles.

Figure 3: JRaDS 40T showing front "basket" for storage of debris or blown-off vehicle parts.

Figure 4: Mired vehicle.

The two onboard winches can pull a combined total of 100,000 pounds, and when coupled with the two snatch blocks in the mission equipment, they can pull a combined 200,000 pounds when the 40T is attached to the prime mover for stability. This amount of pull is required to pull an MRAP vehicle out of mud when it is in a mire factor 2 situation (mired to the top of wheels and estimated at two times the vehicle weight).

Figure 5: JRaDS lift and tow over rough terrain capability.

The hydraulically actuated tailgate is capable of lifting 40,000 pounds. Its main advantage is to quickly lift and tow a disabled vehicle. The tailgate can similarly be used to lift up a damaged vehicle missing an axle or axles so that a skid-plate or sled can be placed under the vehicle to facilitate loading. Its other advantage is an additional 3.75 feet of deck space for extra long equipment when lowered.

JRaDS 40T specifications and capabilities are summarized below:

- Length: with tailgate fully extended: 62 feet; tailgate up: 58.25 feet.
- Deck length: 34.5 feet, 38.25 feet with tailgate fully extended.
- Width 102 inches.
- Curb weight (including crane, Basic Issue Items (BII), mission equipment): 56,600 pounds.
- Prime movers: M1070 HET, M983 LET A2, M916 and Marine LVS MK 48-16, compatible with LVSR.
- Up-righting rolled over vehicles using winches and snatch blocks when needed.
- Ravine recovery from the trailer's side.
- Disabled and catastrophically damaged vehicle recovery including Category III MRAP.
- Recovery of vehicles from mire factor 2.
- Lift and tow with tailgate up to 40,000 pounds of force.
- Loading/unloading 20-foot ISO containers, CROPs and Flatracks.
- Drive-on loading (without disconnecting the trailer from the prime mover) and transport of engineering equipment.
- Tethered controllers and JRaDS 40T mounted controls are used to operate the tailgate, repositionable wheels, deck tilt, stabilizers for crane, winches and the APU. The tethered controller cable is 100 feet long and it allows the operator a better loading overview and increased operational safety.

Figure 6: JRaDS transporting an M984 truck.

Figure 7: JRaDS team often responded to theater loading challenges – CH-47 loading demo at APG.

Figure 8: JRaDS trailers (40T left, 34T right) self loading and unloading 20-foot ISO containers using mission equipment.

Following a successful operational demonstration at Fort Campbell in April 2010 with the 101st Sustainment Brigade, its soon-to-be-deploying commander requested the JRaDS trailers to support his unit in *OEF*. An ONS was validated and all four 40Ts were deployed in December 2010. This deployment proved JRaDS can satisfy needs encountered in theater and is a great JCTD accomplishment. Below are a few of our theater success stories.

3.6.1.1 C-17 Recovery

A C-17 recovery with the deployed JRaDS trailer made the news. Defense News posted the story and a short video of a C-17 recovery. The C-17 went off the runway at Forward Operating Base Shank and the JRaDS presence enabled a recovery as opposed to dismantling the C-17 in-place. The 40T was tilted to the ground as the C-17 nose (front landing gear was damaged) was positioned onto the trailer bed. The extreme off-road suspension made the move easier as the terrain off the runway was very uneven. The JRaDS RTS was used as the nose gear for the C-17 recovery and can be seen sandwiched between the two M984 wreckers, which were used to pull on each of the main landing gear.

Figure 9: C-17 is recovered from the end of a runway through uneven terrain using JRaDS 40T.

Figure 10: C-17 rests its nose on the 40T JRaDS during a C-17 recovery operation.

3.6.1.2 MRAP Vehicle Recoveries

The following pictures highlight various recovery operations using the 40T as the main recovery asset. Details are scarce on the recoveries. Other (non-pictured) highlights include a fuel tanker recovery, which was unreachable with other recovery assets and a recovery of a broken-down MRAP Recovery Vehicle that failed during a recovery mission.

Figure 11: JRaDS 40T with its tailgate down transporting MRAP vehicle with a mine roller attached.

Figure 12: Up-righting a vehicle with JRaDS tailgate.

Figure 13: JRaDS 40T transporting two-at-a-time, battle-damaged MATVs.

Figure 14: Two battle-damaged MATVs in transportation up and over ravine.

3.6.1.3 Other Missions

Figure 15: Apache recovery in OEF with 40T JRaDS.

Figure 16: The trailer's long bed is well suited for transportation of long vehicles such as a school bus.

Figure 17: Grader loading capability of 40T JRaDS during OEF.

Figure 18: M984A2 wrecker loaded for transport.

3.7 34T JRADS TRAILER

Shortly after 40T variant testing began, the design and development of a second variant, a 34T line hauler, which enables intermodal transportation, was completed. The 34T variant provides recovery support for vehicles up to its payload of 68,000 pounds, with emphasis on cargo loading and distribution. Just like the 40T, the 34T is dependent on its prime mover only for automotive power and air that is delivered to the trailer's brake system. The trailer has an onboard APU that provides all hydraulic and electrical power to the trailer's auxiliary systems. The cargo deck is modular, has an outrigger system to extend the deck width from 98 inches to 120 inches, and can be equipped with a powered roller deck kit. The trailer hydraulics, bogey and winches are operated either from a single control station on the trailer or by a remote controller that is tethered (100-foot cable). Logistics distribution, loading and off-loading aircraft, port opening and engineer support missions are quicker and easier when loading to and from the ground by tilting the trailer bed and when using the winches compared to traditional means. Recovering damaged vehicles, such as MRAP, is also possible and was demonstrated by the Marines at Fort Leonard Wood Recovery School and at the Marine Corps Air Ground Combat Center Twentynine Palms (29 Palms). The two onboard upgraded traction winches are user-friendly and can pull 70,000 pounds of constant pull. When coupled with the two snatch blocks in the mission equipment, the trailer's winches can pull 140,000 pounds when attached to the prime mover for stability. This variant can transport one 40-foot ISO container or two 20-foot ISO intermodal containers on its trailer bed. The overall 53-foot length allows the trailer to travel without permit in the U.S. and the 98.4-inch width meets the European Union international width limit.

When selecting performance objectives and designing this variant, the JRaDS team applied lessons learned from the 40T variant. A major demonstrated technological difference was the independent, load-sharing suspension. The 34T has optional equipment including a crane and the CHD, which is a powered roller deck for cargo loading on and off aircraft.

Figure 19: 34T JRaDS trailer.

The 34T is a fifth-wheel tilt-bed semitrailer that can be pulled by various organic military fifth-wheel trucks, except the M1070 HET, due to the lack of the longer gooseneck required for HET compatibility. The three-axle, hydraulic, independent suspension was designed for operations over rough terrain and is capable of being hydraulically moved fore and aft to assist in the loading process and in balancing the payload for transport. All three axles share loads equally on each side. Each axle is rated at 30,000 pounds and is equipped with air brakes. All 12 wheels are Accuride steel wheels, equipped with ABS and with Michelin 275/70R22.5 XTY2 tires. The suspension also has the capability to level the deck (side adjustable for height, pitch and roll) for aligning with aircraft cargo or other loading platforms to facilitate palletized cargo movement. This allows direct interface with tactical platforms (C130) and strategic (C17 and C5) airlift aircraft to facilitate movement of 463L palletized loads.

The 34T has an optional crane that can pick up break bulk cargo up to 2,000 pounds within 12 feet of the crane's centerline (24,000 ft-lbs). The crane is controlled with dedicated controllers tethered to the crane. All other JRaDS capabilities are controlled by both tethered controllers and mounted controls.

Figure 20: Demonstrated drive-on loading of engineer equipment during operational demo at Fort Leonard Wood – December 2010.

The JRaDS 34T is equipped with a 42-HP Kubota diesel APU, which provides power to operate its electrical and hydraulic systems including: the tilt-bed, four standard 110 Volt A/C outlets, landing legs, the optional crane and CHD, standard NATO export DC power, and two 35,000-pound rated onboard winches used to load damaged vehicles, ISO containers, CROPs and flatracks. The tilt-bed is equipped with restraints and rigging that are necessary to secure and evacuate the intended load. The 34T's design demonstrated that this LH trailer can also recover catastrophically damaged or dead-lined vehicles and pull them onto its deck, including heavy engineer equipment, without the aid of additional MHE and without having to uncouple the trailer from its prime mover.

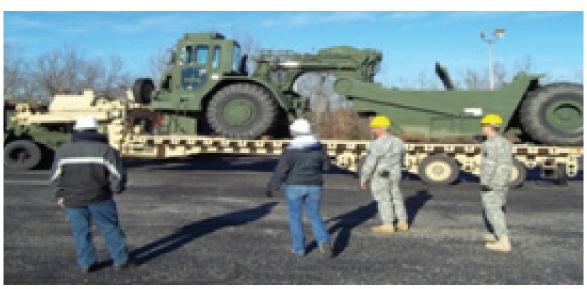


Figure 21: 621B scraper with articulating center led to 34T's additional tie-down modification.

Figure 22: Engineer support is made easier with JRaDS 34T trailer.

Figure 23: C-130 loading during an operational demo with the 34T JRaDS at 29 Palms, March 2011.

JRaDS 34T specifications and capabilities are summarized below:

- Overall length: 53 feet.
- Deck length: 40.5 feet.
- Width 98.3 inches (expandable to 120 inches).
- Curb weight (with BII and mission equipment): 53,000 pounds.
- Prime movers: (tested with and found compatible with) M983 LET A2, M916, M915 and LVS MK 48-16 and LVSR.
- Off-road mobility — Delivery of assets to FOB over off-road terrain.
- Catastrophically damaged vehicle recovery up to the trailer's payload.
- Disabled vehicle recovery.
- Self-load and transport two 20-foot ISO container or one 40-foot ISO container.
- Transport of engineering equipment.
- Recovery and transport of rotary aircraft.

Figure 24: The 34T recovers helicopters.

3.8 TILT

The TILT is a lightweight trailer, weighing 11,500 pounds, which was designed by Concurrent Technologies Corp. (CTC) and manufactured by Utility Tool and Trailer. It is capable of self loading, self-off loading and transporting vehicles, engineering equipment, break-bulk cargo and two fully loaded 463L pallets. The TILT brings tactical distribution and light vehicle recovery capabilities to the fleet. Other features and compatibilities include:

- U.S. highway legal.
- Off-road capability with self-steering axle.
- 14 tons of payload capacity on a 20-ton gross vehicle weight platform.
- Air transportable by C-130 / C-17 and CH-47 (sling-loaded).
- Pintle-towed using HEMTT vehicles, FMTV, Medium Tactical Vehicle Replacement vehicles (MTVR), M916 (demonstrated) and MRAPs.
- Two hydraulically actuated 18,000-pound capacity winches and lightweight 60,000–pound snatch blocks for recovery or distribution missions.
- Cargo/equipment tiedowns and ISO locks at each corner for 20-foot ISO container transport.
- Self-contained mission equipment is stored in trailer storage box.

During a limited demonstration at Fort Leonard Wood in December 2011, the TILT demonstrated military utility to recover, self-load and offload damaged or disabled MATVs within its 28,000-pound payload capability and 36,000-pound total single line pull-winch capability.

Figure 25: TILT prototypes drive on angle will be reduced by one to two degrees on the production version.

Figure 26: TILT's steep angle design was considered beneficial for quick off-loading capability aiding humanitarian support.

Figure 27: TILT multi-functionality could benefit the warfighter by reducing the logistical footprint.

JRaDS 14T trailer residuals were transitioned to the National Guard at the end of the demonstration program. Currently, National Guard uses the trailers to perform transportation missions on the base where these trailers are located. Recent comments from the National Guard Soldier are the kind of comments we should solicit and welcome to help us make the best equipment possible. Here are the Soldier's comments: (Even though this trailer came with a portable APU, it was, in effect, designed for a vehicle with hydraulic capabilities.) "A small trailer in the Army's fleet should have its own APU so the hydraulic pump can control the trailer. Then any vehicle that is 2.5 tons and above without hydraulic capabilities could tow this trailer." (This trailer in its design was optimized for the HEMMT, with 5-ton truck and PLS as other reasonable transporters. Payload capability would be very low with 2.5-ton truck.) "Smaller units could have their own recovery asset by having one or two of these trailers assigned to their Modified Table of Organization and Equipment. Also having an air assist would be more effective to the current hand jack for the adjustable elevation of the trailer tong. All Army vehicles 2.5 tons and above have air capabilities. Having tracking guides would aid the recovery of downed vehicles, especially for vehicles with flat tires." (This we, the JRaDS JCTD team, actually demonstrated and we agree that the final trailer configuration should have tracking guides.)

The Soldier then apologizes by saying: "I know this sounds negative but we do think that this trailer is a great idea for small recovery assets for small special force units, MPs, and infantry units Extended Combat Training. Hauling fixed containers are ideal for the same type of units equipped with anything from maintenance, Explosive Ordinance Disposal to peace time hurricane relief. The fine tuning we mentioned above would make the trailer more marketable."

Figure 28: TILT being towed by MATV; TILT's lightweight (six pounds at 60,000 pound capacity) snatch block is off the shelf.

JRaDS 14T specifications are summarized below:

Gross Vehicle Weight (GVW)	40,000 lbs.	Overall Height	58 inches
Vehicle Curb Weight (VCW)	12,000 lbs.	Deck Height	55 inches
Payload (maximum)	28,000 lbs.	Deck Height at Maximun Tilt	193 inches
Overall Trailer Length	334.5 inches	Ground Clearance	11.3 inches
Deck Length	264.5 inches	Track Width	79 inches
Overall Width	98.3 inches	Approach and Departure Angle	40 degrees
Deck Width	96.0 inches	Breakover Angle	30 degress

3.9 JRADS MISSION EQUIPMENT

The mission equipment and options, such as a crane, a roller deck, or winches will allow for fewer trailer variants to satisfy a larger number of missions. The mission equipment used for the JRaDS JCTD allowed for multiple types of recoveries and tactical distribution in areas without any additional MHE. The JRaDS snatch block (NSN: 3940-01-602-8022, Item Name: BLOCK, TACKLE) was developed under this program, which is much lighter than existing snatch blocks approved for field use (approximately 50 pounds compared to 200 pounds). No less significant is the skid-plate and cribbing system. For vehicles that are missing axles, the vehicle is lifted and placed on top and restrained onto a recovery skid plate. Recycled rubber cribbing is used to better secure the recovered asset, to ensure proper ground clearance while winching, and to prevent sharp edges from causing any further damage. Equipment packages, matched with a specific mission, allow the same trailer to satisfy different tasks.

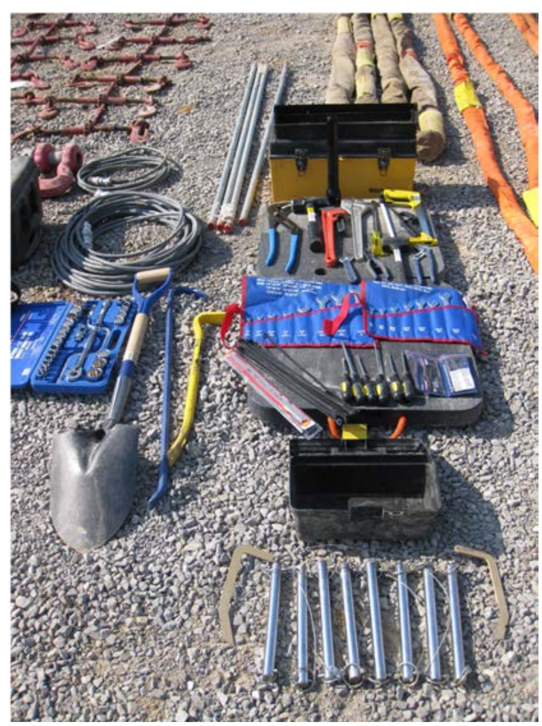


Figure 29: Missions equipment included with the JRaDS.

The JRaDS are equipped with a range of BII to support recovery, loading, load tie-down and off-loading (e.g., hydraulic anchoring system for recovery, tie-down chains, wheel guides, binders, snatch blocks, shackles, etc.)

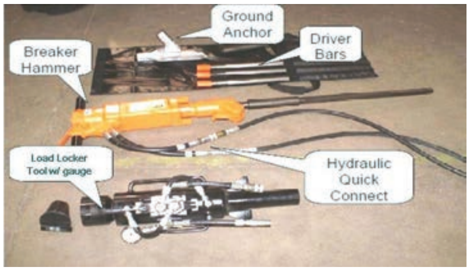


Figure 27: JRaDS mission equipment included ground anchoring system.

3.9.1 Lightweight Snatch Block:

The lightweight snatch block, developed for the JRaDS program, can double the winch's capacity. Two snatch blocks per trailer are included in BII. The lightweight (about 50 pounds) snatch block can be easily carried and handled by one person.

Figure 26: JRaDS lightweight snatch blocks: The one on the left, NSN: 3940-01-602-8022, is for steel cable. The one on the right is for synthetic rope and was only used with TILT trailer.

3.10 JRADS SUPER ACHIEVEMENTS

The JRaDS Demonstrator Program has achieved many results that are beyond many traditional research and development projects. These include:

- Capability deployment of 40T to Afghanistan that recovers catastrophically damaged wheeled vehicles including Catagory III MRAPs and downed helicopters transporting them back to base without the need for MHE.
- Assisted in recovery operation of an off-runway C-17 Globemaster III with damaged landing gear.
- Performed all planned and additional program tasks within schedule and under budget.
- Prepared Purchase Description for a future trailer system with JRaDS capabilities.
- Transitioned JRaDS 34T residuals to National Guard.
- Provided CASCOM with a list of requirements for a possible F3T.
- USMC is drafting acquisition documents to procure similar trailers.
- Transitioned JRaDS 14T residuals to National Guard.
- Shared JRaDS 14T lessons learned with PM Light in support of Light Equipment Utility Trailer (LEUT) acquisition.

4 REQUIREMENTS

4.1 REQUIREMENTS AND REQUIREMENTS DOCUMENTS:

The TARDEC TM insisted, at the beginning of this JCTD program, that the data collected by CASCOM during four joint user conferences would become available for the program so that a truly useful trailer system would be the result of the JRaDS acquisition. The data was received and the TARDEC team evaluated this data as well as all existing trailer Purchase Descriptions and the applicable prime movers used by the Army and UMSC. The below table is the result of data summary from CASCOM's Joint User Conferences, which aimed at identifying requirements for the FT3 (also referred to as the New Start Family of Trailers (NSFT)) as identified in 2008. The table's right side shows how JRaDS fills the CASCOM identified requirements.

NSFT			JRaDS		
Variant	Cargo Capacity	Characteristics	Variant with updated status	Cargo Capacity	Characteristics
Tactical Logistic	13.5 ST	1x20' ISO container	14 JRaDS Built, tested and demonstrated; slated for extended use with National Guard	14 ST	Pintle Tow via FMTV and heavier trucks Minimum Length: 2x463L pallet, 1x20' ISO Maximum Length: 27'
Medium Logistics Trailer	26.5 ST	1x20' ISO container	34T JRaDS Built, tested, demonstrated, and refurbished; transitioned to National Guard.	34ST	Two 20' ISO or one 40' ISO containers, break bulk pallets, four 463L pallets Recover and transport Light/Medium TWVs and Armored Wheeled Vehicles Recover and transport Light/Medium Rotorcraft Deck extandable to 120 inches
Move Medium Engineer Equipment	26.5 ST	1x20' ISO container			
Aircraft Recovery	26.5 ST	1x40' ISO; Expandable to 10' width			
Heavy Logistics*	40 ST	1x40' ISO container	40T JRaDS Built, tested, demonstrated, refurbished, retested, then supported through FSR in AOR; performing recovery and transportation missions.	40 ST	1x20' ISO container transport heavy engineer equipment Recover and transport Heavy TWVs
Move Heavy Engineer Equipment	40 ST	Width 8', length 41'8"			
Recover Heavy Wheeled Vehicle	42 ST	1x40' ISO container			

Exhibit I-6: New Start Family of Trailers – JRaDS Comparison
*The Heavy Logistics mission was also targeted by the 34T. The 68,000-pound payload was chosen to match the M915 tractor and M872 trailer combination capabilities.

More explicitly, the requirements given to the JRaDS JCTD team from CASCOM included OURs. The OURs, together with the capability gaps compiled in the Army Transportation Tactical Wheeled Vehicle Functional Needs Analysis (Approved Nov. 3, 2005) and the Marine Corps Combat Development Command (MCCDC) Front End Analysis (FEA) dated 2007, directly established the foundation for the JRaDS performance specifications. A Requirements Crosswalk (see following table) shows the actual contract Performance Work Statement and traces the requirement to the documented user need. The Crosswalk also links the specifications to the appropriate MIL-STD and DOT requirements; as well as to the prime mover capabilities.

Table 1- Traceability of Contracted Performance Work Statement to Requirement Source

Operational User Requirement Summary	Enabling Technologies	Documented Requirement Source
Truck compatibility – All existing DoD prime movers	Configurable kingpin (2-inch / 3.5-inch) gooseneck height adjustment	CASCOM - OURs
Payload (various, mission-dependent)	High-strength steel frame and deck	CASCOM - OURs
Cargo compatibility/tiedowns/ containers – maximum compatibility	16-plus heavy cargo tiedowns, 36 small cargo tiedowns, 20 ISO cargo provisions, chains / binders	CASCOM - OURs
Shoring/mooring system	cribbing system, skid plates	CASCOM - OURs
Material handling; cargo self loading/unloading.	winches, tilt-to-ground, crane, CHD, adjustable height suspension	CASCOM - OURs TWV FNA - Gap 6 MCCDC FEA Gap 3
Transload between cargo aircraft/ other systems	roll/height adjustment in suspension, CHD	CASCOM - OURs TWV FNA - Gap 8
Vehicle, engineer equipment and rotorcraft loading, recovery and evacuation	winches, tilt-to-ground, crane, cribbing, ground anchors, 100K snatch blocks, recovery skids, electrical power output, work lighting	CASCOM - OURs TWV FNA - Gap 6 MCCDC FEA Gap 5
Off-road mobility, slopes, dynamic stability, speed, fording	load-sharing independent suspension, ride-height adjustment	CASCOM - OURs HEMTT A4 PD TWV FNA Gap 6 MCCDC FEA Gap 2, 3
Standard requirements	bumpers, lights, tractor-trailer interfaces, fuels/lube/oil, brakes, wood treatment, corrosion, reliability, transportability, blackout lighting, etc.	Mil-STDs, SAE Standards, Federal Motor Carrier Safety Regulations (FMCSR), Federal Motor Vehicle Safety Standards (FMVSS)

During the JRaDS JCTD's second year, the JRaDS team hired a contractor to work at CASCOM to obtain a Capability Development Document (CDD) from CASCOM. The draft document that resulted was not accepted by CASCOM and all our data and efforts were mostly dismissed resulting in an Initial Capability Document (ICD), which is now being staffed for signatures. The TM offered to evaluate the ICD prior to its staffing, but did not receive it.

4.2 REQUIREMENTS FOR LOGISTICAL SUSTAINABILITY

Reducing the logistical footprint and the overall environmental impact must be considered early during system development. These considerations will reduce cost — especially if the JCTD transitions to a PoR. The JRaDS team considered this need up front. The APU manufacturer identified Royco 717 for the needed viscosity to make the engine perform in the wide range of temperatures called for in the performance objective. The TM contacted the TARDEC Fuels and Lubes POC and asked for advice on what lubes to select that are in the Army inventory as standard fluids. Our analysis showed that our standard 46170 6083 is sufficient for our use and is already in the DoD inventory. The Army specification actually had wrong lower temperature data in the chart and that was the reason the contractor was recommending Royco 717.
Jet propellant 8 was chosen as the primary fuel, with compatibility to DF-2, JP-5, and Jet A-1.

4.3 PROPOSED TRAILER REQUIREMENTS FOR FUTURE FORCE FAMILY OF TRAILERS (F3T):

Previous research revealed more than 180 types of trailers in the Army inventory. While it may be impossible to replace all of them, having a Family of Trailers with a common, reconfigurable platform is vital to reducing the number of variant and the overall lifetime cost of trailers. While the JRaDS JCTD highlighted the technological possibilities of a future trailer fleet, there is no doubt that simple trailers will still be necessary. The F3T should have a platform that is robust enough to handle different equipment/technology packages. For example, while the JRaDS had an on-board APU, a future trailer may only use PTO hydraulic pressure from the prime mover to power winches. A different trailer may not have winches or tilt-to-ground capability – but still have the off-road, load-sharing suspension. Such options may be necessary to reduce the next generation F3T's procurement and sustainment costs.

The TM suggested the following list of F3T capabilities to CASCOM combat developers. Of note, the requirements can be met with add-on kits to a base configuration – such as an optional on-board APU or optional crane.

[red] = Does not have Capability [yellow] = Meets Threshold Capability [green] = Meets Objective Capability

CAPABILITY	Threshold	Objective	JRADS 14T	JRADS 34T	JRADS 40T
Prime mover compatibility (suggested KPP)	Capable to interface with all current Army and Marine fifth-wheel trucks in its weight category (such as M983, M916, LVS, LVSR with 3.5-inch kingpin)	Compatible to interface with HET through an extended Goose neck	Designed for pintle hook up	[yellow]	[green]
		Interchangeable 3.5-inch to 2-inch kingpin for M915 interface	N/A	3.5 or 2 inch compatible [green]	3.5 only
Loading and off-loading compatibility (suggested KPP)	Capable to load and off-load from the ground without MHE	Capable to load a 20-foot ISO container from ground without MHE in less than 15 minutes	Not demonstrated [yellow]	[green]	[green]
Mobility (suggested KPP)	Capable of traversing cross country and uneven terrain while keeping the cargo at near horizontal position for sensitive load transport, i.e. suspension designed for off-road mobility and load sharing	Independent off-road suspension that provides a "soft" ride suitable for rotary-wing aircraft recovery	provides off-road mobility [yellow]	Independent air over oil suspension [green]	Independent air over oil suspension [green]
	Capable of safely operating beyond improved and substantial road network, at GCWR matching the mission profile of M983A4 LET	Capable of safely operating over M983A4 LET mission profile at maximum trailer payload	[green]	[green]	[green]
	Air Transportable by C5 and C17	Air transportable by C5 and C17 without disassembly (drive on loading)	Also C-130 and CH-47 transportable [green]	[green]	[green]
Recovery capability (suggested KPP)	Capable of recovering up to 34 tons of catastrophically damaged vehicle payload (CAT I&II MRAP, STRYKER, D7 Dozer)	Capable of recovering up to 40-ton vehicle payload (CAT III MRAP)	up to 14-ton payload	34T demonstrated Buffalo recovery [yellow]	40T [green]
	Ability to load catastrophically damaged wheeled vehicles (Stryker, CAT I and II MRAP)	Ability to load catastrophically damaged wheeled vehicles (Buffalo, CAT III MRAP)	up to 14-ton payload	Demonstrated Buffalo recovery [yellow]	[green]
	Capable to recover a vehicle from Mire Factor 2 up to trailer's payload	T=0	up to 18 tons with winches [green]	[green]	[green]
	Capable to load vehicles from the ground without uncoupling from the prime mover	Capable to "lift and tow" quick recovery in 5 minutes (Example: actuating tailgate)	[green]	Modified to 40,000 pound rating [green]	40,000 pounds [green]

	Trailer equipped with two winch(es) capable of aiding vehicle recovery	Trailer equipped with two winch(es) capable of vehicle recovery up to the payload of given trailer.	Two 18K pounds	Two 35K pounds	Two 50K pounds
	Trailer designed and prepared for an optional crane with 2,000 pound lift at a 10-foot radius	Trailer designed and prepared for an optional crane with 8,000 pound lift at a 10-foot radius	N/A		
	Capable of guiding wheeled vehicles onto trailer to ensure proper placement on deck (Example: Provide wheel guides)	Capable to load wide engineering equipment beyond the trailer deck's width. (Example: Provide removable wheel guides)			
Haul Capability	Haul one fully loaded 20' ISO container	Haul two 20' ISO containers			
		Haul one fully loaded 40' ISO container			
	Haul one CROP	Haul two CROPs			
	Haul one flat rack	Haul two flat racks			
Aircraft Interface	Ability of deck height to be raised and lowered to interface with C-130, C17 and C-5 to facilitate aircraft loading and off-loading.	Deck can be tilted side-to-side for better aircraft interface		Adj Height 43-72 in	Adj Height 43-72 in
	Trailer deck can accept a 463L pallet	Roller deck to facilitate handling of 463L pallets			
Soldier Interface	Provide control panel	Provide remote control with cable to allow for operator to be +50' away while operating the trailer.			
Aux Power	Ability to generate power (hydroelectric)	Hydraulic PTO to run tools		45 hp APU PTO capable	99 hp APU
	Ability to generate power (electric)	Generate 120V outlets			
Trailer Sized for Cargo	Length overall (M983A4 LET plus trailer)	NATO Legal of Truck + Trailer = 45.92'	truck + 27.75 ft	74.4 ft	80.0 ft
	Trailer deck length with ability to recover Stryker	Trailer length with ability to recover Stryker equipped with SPARK roller system attached or 3-axle MRAP vehicle	N/A	40.4 ft	34.5 - 39 ft with tail gate down
	Ability to haul 20' ISO	Ability to haul two 20' ISO or one 40' ISO container	not fully loaded	40.4 ft	34.5 ft
	Width - US Legal = 102 inches	NATO Legal = 98.4 inches	96 in	98.4 in	102 in
		Expandable deck	Not Expandable	Expands to 120 in	Not Expandable
	Trailer weight shall be optimized for payload being carried	T=0	12,000 lbs	*	**
Recovery Tools	Provide replaceable skid plate to prevent trailer deck damage from sharp jagged metal while loading catastrophically damaged vehicle.	Transferable to be used with any system			
	Ability to operate an optional ground anchor system	Ability to operate an optional ground anchor system from trailer power source	with PTO upgrade capable	with PTO upgrade capable	PTO from APU
* The maximum allowable trailer weight is calculated from M983A4 LET GCWR, which is 151,000 lbs, subtracting 37,400 lbs of M983 A4 LET CW, then subtracting given trailer's design payload.' (when towed with M983A4 LET)					
** 40T was designed for LVSR and HET					

Figure 30: Proposed F3T requirements based on CASCOM-identified Joint-user needs and demonstrated JRaDS JCTD capabilities and lessons learned.

5 LESSONS LEARNED

5.1 TM'S RESPONSIBILITIES AND LESSONS LEARNED

TM's responsibilities are well defined within the OSD's JCTD POG. JRaDS JCTD TM's team adhered to what was needed to make the program successful. The POG also states that the TM needs to be on the IPT for the OM and the XM. Below are lessons learned corresponding to each POG-identified TM responsibility.

- Manages JCTD contract(s) — Involve your contracts' experts and make them part of the team! More is described in this report's contracts section.
- Oversees testing — Stay involved, be the one the TM goes to! At first the TM did not get involved in prioritizing test efforts beyond what was spelled out in the test plan. However, soon it became apparent that other JCTD members started asking the TM to change direction. At the TM's request, all future work or schedule adjustments came through the TM. This way the TM could focus on accomplishing the needed tasks in an organized fashion.
- Participates and contributes to the OUA planning — Understanding the evaluation process is vital to testing and tech demo coverage. The COIs were set to be measured to the Army and Marine gaps. The TM had to convince the OM and the DOM to participate in the original start-of-work meeting when the COIs were decided. The knowledge gained from this meeting shaped the future test requirements, which were necessary to gain a safety release for future operational demonstrations.
- Integrates and technically demonstrates the capabilities and applicable technologies — Use system engineering approach to integrate the demonstrated technology, keeping in mind limitations and required testing for the needed safety release. The TM needs an in-depth understanding of all technologies and all capabilities to be demonstrated.
- Delivers the Joint capability solution to the OM for demonstration — stick to the schedule, make your word count. This is just practical and best practices approach. Keep your word and follow through.
- Develop and provide training — Have a hand's-on training expert on your team. As important as classroom training is, it is even more important for the warfighters who will be involved in an Operational Demonstration to spend enough hand's-on training time to be comfortable and competent in operating the system. This is important for safety reasons and it is also important from the perspective of giving the system a fair and proper evaluation.
- Participates and contributes to transition planning — Transition planning provides focus to JCTD; deployed JRaDS trailers were upgraded per Soldier, Marine and JRaDS JCTD Team suggestions, within available funds and schedule. Extended use of JRaDS residuals was planned for recovery missions in Afghanistan. Keep the overall goal in mind and prevent mission creep. Without a specific mission in mind, a system may be under or over designed, which adds complexity, weight and cost, while reducing reliability.
- Continues to support JCTD during transition — Teamwork is essential, to save time and cost and avoid mistakes, and take advantage of lessons learned, the TM needs to communicate technical knowledge to the XM for future program success.
- Serves as JCTD financial manager — financial visibility and accountability in one office is vital to the program; flexibility reduces risk of unknown events.
- Obtains local supervisor's support — ensure the TM team's local supervisor is a great program supporter. The JRaDS JCTD was successful and supported in Afghanistan only because local supervisors supported the TM team, even after JCTD funding ceased.

5.2 JRADS PROGRAM OBSTACLES:

Following is a list of items that caused program delays and suggestions to aid future program success:

- **Cost:** funding timing was not synchronized with timing of JCTD events. This was overcome by adding flexibility to the contract, which allowed future contract modifications. However, the funding obstacle still caused program delays.
- **Schedule:** weather, testing asset availability, repairs needed to trucks and trailers, skilled operator availability, deployment schedules, policies, and organization priorities all affected program scheduling. These are present during any testing. What surprised us was that trucks that we received on loan and which just came from reset needed many repairs that cost our program more than $100,000. We were not able to calculate the exact amount we spent on truck repairs, or the time we spent waiting for a truck, due to the lack of this type of tracking at Aberdeen Test Center (ATC). We suggested our ATC Test Manager would suggest to the repair facility tracking repair costs of loaned vehicles to aid future programs.
- **Performance:** lack of approved Requirements Document (ICD / CDD / CPD) led to reduced support from the XM. Lack of Requirements Documents has prevented transition into a PoR. TACOM, TARDEC and CASCOM, United States Army Training and Doctrine Command (TRADOC) need to improve their collaboration.
- **XM Turnover:** multiple XM turnover throughout the JRaDS program caused lower support and focus, disorganization, and general miscommunication. XM turnover stemmed from lack of XM office resources for this program, which ties into the lack of approved Requirements Document.
- **Business Case Analysis – incomplete:** the BCA did not consider JRaDS' multi-mission capability, since no supporting data for other equipment could be obtained by the contractor to include in the BCA. The cost comparison between two systems: JRaDS and the other system showed JRaDS to be more expensive based on this incomplete BCA.
- **Large obstacles:** no consideration in the Federal Acquisition Regulation to facilitate sole source contracting actions for JCTDs — despite program authorization by Senior Executive Service/General Officers to use a specific contractor. Gaining the proper authorizations for sole-source contracts took a lot of time and resources. This led to 6- to 8-month contracting cycles, which were very large obstacles! Plan early and team with contracting personnel.

5.3 LESSONS LEARNED – REASONS FOR PROGRAM SUCCESS

For the process to work smoothly, certain program needs are required, including:

- **A "validated" requirements document:** we didn't have a validated requirements document, so we needed to validate that the requirements identified by CASCOM during joint user conferences performed in F3T support were realistic and accomplishable. The TM lead this validation.
- **Draft transition plan:** we had a draft that we worked on with the XM. This experience was valuable to the TM's understanding of what would be required if this system transitioned to a PoR.
- **Funding issue mitigation:** we did not receive sufficient funding when we needed it. We mitigated this issue by writing work directives for the contract in such a way that the contract could be easily modified once the funds showed up. This took a lot of understanding both from the contracts and from the contractor's perspective.
- **Continuity in team members:** the TM team, for the most part, was stable. Some members left and others came, but the core remained the same. Team member commitment was crucial to minimize waste and take advantage of lessons learned.
- **Support from the other two JCTD managers:** teamwork and good collaboration was essential. A lot of effort was placed on proper communication. Keeping an updated schedule and hosting regular meetings

that involved the whole team including the contractor were important. A skilled and committed individual needs to follow through on schedule updates, facilitate the meetings, and update the action item list.

- **Staying focused and on target:** the ultimate goal was and always should be to support and deliver the best solution to the Soldier. The "how" is generally the discussion that needs clarification and agreement within the JCTD team. How do you define success? Is your success the same as the success of others on the team?

5.4 SUGGESTIONS FOR FUTURE PROGRAMS

The following is a list of items and/or suggestions for future programs on the items that were key to making our program successful:

- Keep communications open between all team members.

- Listen to the team members' suggestions following testing and demonstrations on how to improve the system. The comments from the 15 Recovery Specialist Soldiers that participated in the 40 T JRaDS operational demonstration at Fort Campbell were studied and many of their suggestions were incorporated into the trailer through a set of upgrades performed prior to their deployment for extended use to Afghanistan. Modification upgrades were also done based on other JRaDS JCTD member suggestions, which came from the TM team, the OM team, the contractor, test manger and his operators. These warfighter and civilian specialists answered what they liked about the JRaDS, what they believed was not necessary, what they would change with consensus and what they would change with disagreements.

- Support the deployed systems. We contracted and sent a field support rep to keep the deployed trailers mission-ready in Afghanistan.

- Manage by trust. The TM clearly communicated the responsibilities and identified a lead for each task and received a buy-in from each team member. Respect for each team member was shared amongst the team. The team operated in a spirit of collaboration.

- While it is the OM's responsibility to gather the user requirements according to the POG, the TM needs to be involved as soon as possible in the process. The TM needs to have a superb requirements understanding and the reason that those requirements exist. The TM should strive to attend any meeting or discussion involving the users' requirements. The TM team has the necessary technical knowledge to ask the right questions to make the users' requirements actionable in a performance specification. User requirements are translated into performance objectives for the Performance Work Statement.

- It is important to keep the XM engaged in the program to ensure that the JCTD products with military utility will transition.

- While the OM coordinates for the Operational Demonstrations, the TM is responsible for all Technical Demonstrations (TD) and understanding how the TD will aid in the future performance of the OD is essential.

6 TRANSITION

6.1 JCTD TRANSITION

Transition and planning for transition are integral efforts of each JCTD. Transition can be met in many ways to a smaller or greater degree depending on the program's maturity and the technology's readiness to transition to a PoR. The transition to a PoR is the ultimate desire for each successful JCTD, but any portion of the demonstrated technology transitioning to a PoR reduces the time for delivering a solution to the Soldier. Transition includes: residuals for extended use, any documentation or data that can help speed up a future system solution, and lessons learned.

6.2 JRADS JCTD'S TRANSITIONS

In the case of JRaDS JCTD, the program transitioned four 40T JRaDS trailers to *OEF* in support of recovery missions. Each trailer system came with BII, mission equipment, and many spares that allow the warfighter to accomplish the recovery missions. Also, the JRaDS JCTD created a new light-weight snatch block design, which can be carried by one person instead of the four-man carry necessary for the existing snatch block currently in the inventory. This new snatch block has the same capacity as the existing model and was transitioned directly to use via an NSN for future use. The 34T JRaDS demonstrators are currently being used by the National Guard for Soldier training and on-base transportation. The 14T JRaDS was also transitioned to the National Guard for on-base transportation and evaluation.

Aside from hardware, there are program data, documents, reports and lessons learned. The document transition products are listed below showing their status.

Deliverable Documents	Working	Draft	Final
Critical Operational Issues			X
Architectures			X
Top-level Capabilities and Metrics	X		
CONOP			X
Financial Management Plan		X	
JCTD Test Plans			X
JCTD Training Manual		X	
Demonstration Plan – Technical		X	
Demonstration Plan – Operational		X	
Management and Transition Plan		X	
OUA Plan			X
Demonstration Execution Document (DED)/Assessment Execution Doc (AED)			X
Integrated Assessment Plan (IAP) w/MOEs and MOPs			X
Transition Strategy	X		
Purchase Description for F3T	X		
OUA Quicklook Reports			X
Final OUA Report			X
DOTMLPF and Policy Recommendation Changes			X
TTP			X
Analysis of Alternatives (All Information Systems – including National Security Systems)	X		
Market Research		X	

Programmatic Environmental, Safety and Occupational Health Evaluation (Including National Environmental Policy Act/Executive Order (E.O.) 12114 Compliance Schedule)	Working consideration given		
Acquisition Strategy	Discussed		
Affordability Assessment		BCA incomplete analysis	
Capability Development Document	X		
Initial Capabilities Document/JCTD		X	
Technology Readiness Assessment		X	
Test and Evaluation Master Plan		X	

6.3 TRANSITION TO PROGRAM OF RECORD (POR)

PM-HTV was identified as the office where this trailer system can transition to and become a POR. The JRADS 40T and 34T variants did not transition to this POR due to lack of validated requirements document, lack of trailer funding and JRaDS capability beyond that of any previous trailer system, which in demonstrated design incurred unjustifiable costs. However, JRaDS' superior off-road mobility has captivated the USMC's interest, which may procure it for that capability.

The JRaDS 14T TILT demonstrator capabilities were evaluated by PM LTV, and the knowledge from lessons learned is being added to the POR, in support of Fort Leonard Wood - Engineer School's LEUT Capability Production Document (CPD). TARDEC's lessons learned from this light-weight demonstrator are being incorporated into this future trailer, showing that the TD performed at Fort Leonard Wood in December of 2011, which showed drive-on loading of Skid Steer Loader and Backhoe Loader capability, was a worthwhile demonstration.

7 TECHNICAL SYSTEM ASSESSMENT

7.1 TECHNICAL READINESS LEVELS

According to official DoD TRL definition, for a system to achieve TRL9, the actual system must be proven through successful mission operations. This requires that the technology's actual application in its final form successfully complete the objective under mission conditions, such as those encountered in operational test and evaluation or during deployment. The 40T JRaDS fully meets this requirement since it has successfully operated in-theater since December 2010. As of the time of this report, the 34T has been operated to a lesser degree by National Guard and it suggests a TRL of 8.

Enabling Technology	Feb. 2010 TRL	Post JCTD TRL	Rationale
Hydraulically Actuated Deck (Degrees of Freedom: pitch, roll, vertical, longitudinal)	6	9	Trailer deck tested at APG, used during ODs, and used in the field. No difficulties with the trailer deck
Adjustable Ride Height	6	8	Adjustable ride height tested at APG, used during ODs, and used in the field. No difficulties with the adjustable ride height capability
Powered Tailgate	7	9	Tailgate tested at APG, used during ODs, and used in the field. No difficulties with the powered tailgate
Specialized APU	6	9	APU (engine, filtration, hydraulic pump, battery, controls, alternator, circuitry) was designed by Mechron and consists of a commercial Kubota diesel engine. Tested at APG, used during ODs, and used in the field.
Articulating Gooseneck	6	9	Trailer was tested with various prime movers at APG with no anomalies noted; No issues noted at ODs or in theater.
Hydraulic Suspension (40T); Independent Hydraulic Suspension (34T)	7	40T – 9 34T – 8	Hydraulic suspension tested at APG, used in ODs, and used in the field with no issues (40T). The independent hydraulic suspension has been tested and demonstrated (34T)
Hydraulic Sliding Carriage	6	9	The sliding (bogey) carriage was tested at APG, used during ODs, and used in the field with no problems
Powered Trailer Rollerdeck	6	8	Trailer roller deck is similar to aircraft roller deck systems developed by Ancra – tested at APG and used during ODs (equipped on 34T only)

7.1.1 Hydraulically Actuated Deck

JRaDS hydraulically actuated deck has four degrees of freedom: Pitch, Roll, Vertical and Longitudinal. The hydraulically powered deck allows for the trailer deck's controlled and independently actuated movement. The pitch degree of freedom is vital for the trailer's ability to tilt-to-ground. This tilt-to-ground ability allows for loading/unloading of equipment, containers and damaged vehicles during recovery operations without external MHE. The hydraulic cylinders allow for 29 inches of vertical travel. This facilitates tire changes, maintenance actions, and enables the adjustable ride height capability. The longitudinal degree of freedom is possible by manipulating the prime mover's and trailer's brakes separately to achieve the desired result. By locking the trailer brakes and releasing the prime mover brakes, the

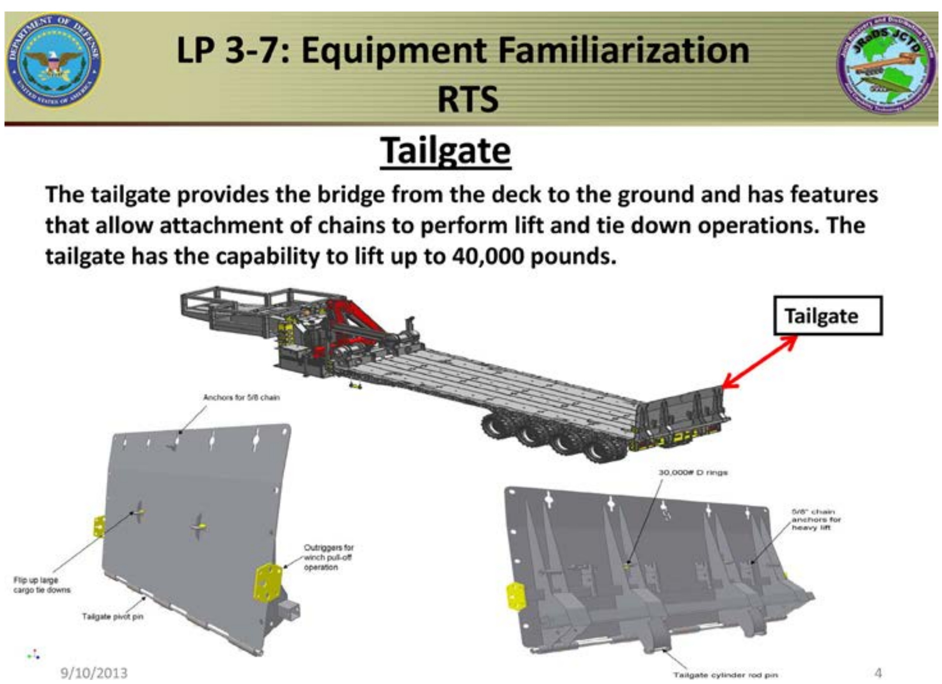
large hydraulic cylinder that powers the moveable bogey is able to move the tractor-trailer combination longitudinally in a very controlled manner. This is useful for minute positioning near a recovery asset as well as for transloading operations. The roll degree of freedom is only available with the independent suspension (34T) option. The independent suspension allows for the right-side's hydraulic cylinders to be actuated independently of the left side and vice versa. The roll degree of freedom is important for sensitive transloading operations with loading ramps of expensive cargo aircraft. One application of this technology has been patented by the main JRaDS designer (patent number: 7950675), and the specific application used for the 40T and 34T is currently patent pending (Fifth Wheel Trailer with Adjustable Deck, application number: 12/489, 828.)

7.1.2 Adjustable Ride Height

The trailer's ride height can change based on the mission need and can raise up to 72 inches to ease any maintenance work needed. There is a direct tradeoff between the ride height setting and the suspension travel. For highway operation, large suspension travels are not needed and a lower ride height enables proper clearance levels for going under bridges. For off-road operation, a large suspension travel is needed and there generally are no bridges to travel under. While the contractor has a suggested "on-road" and "off-road" height, the operators are able to use their judgment to get the necessary suspension travel / overhead clearance. This technology is currently patent pending (application number: 12/489,828).

7.1.3 Tailgate

The hydraulic tailgate operates independent of the trailer deck. This feature provides numerous benefits to include use as a spade to stabilize trailer during loading and winching operations. The tailgate is also used to lift disabled vehicles off the ground to install skid plates for loading ease. The tailgate is also used for "snatch-and-grab" operation for disabled vehicles in a hostile environment.



7.1.4 Specialized APU

The specialized APU on the 34T and 40T is comprised of a diesel engine, filtration elements, hydraulic pump, 120 Hz 110 V AC alternator, battery, fuel tank, hydraulic oil tank, controller (for high- and low-demand operations), and all the necessary circuitry. The unique application of equipping such a power pack on a trailer was initially cause for concern. However, the APU has performed well through testing, demonstrations, and in field use.

7.1.5 Articulating Gooseneck

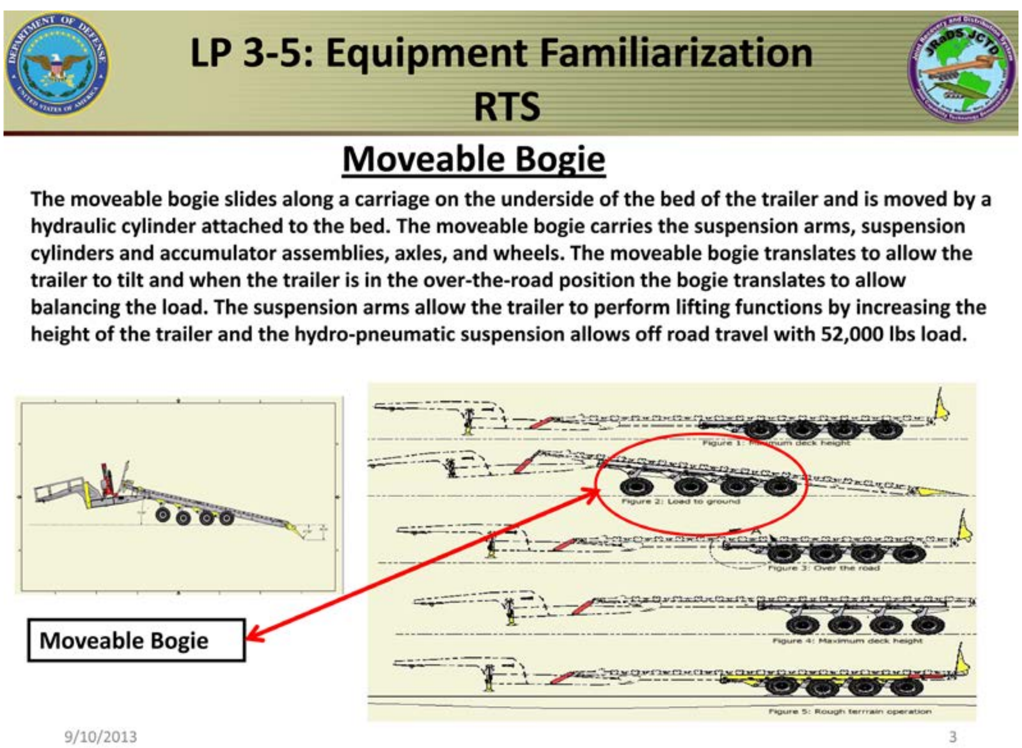
The articulating gooseneck provides hinges that can withstand heavy loads and transfer the load to the prime mover's fifth wheel. The hinges work with the translating carriage to provide a low 77-degree deck to ground angle when the trailer is in the tilt-to-ground mode. This low angle makes loading operations easier and safer. This technology is an enabler in the patent pending Fifth Wheel Trailer with Adjustable Deck (application number: 12/489,828; Description of the Preferred Embodiments, paragraph 0036).

7.1.6 Suspension

The hydro-pneumatic, patented suspension allows for a very smooth ride, even over rough terrain. The axles are plumbed in parallel and allows for a load-sharing effect. The load-sharing suspension transfers force between the axles instead of a direct force straight into the deck, which reduces peak axle loads and peak cargo deck accelerations, and, therefore, reduces g-loads onto the cargo. The suspension exceeded the expectations of both civilian experts and warfighters. This capability is a benefit of the patent pending Fifth Wheel Trailer with Adjustable Deck (application number: 12/489,828; Description of the Preferred Embodiments, paragraph 0040).

7.1.7 Hydraulic Sliding Carriage / Movable Bogie

The hydraulic sliding carriage can reposition the wheel bogies forward and aft to a lower turning radius or center cargo. The movable bogey is a necessary component in the tilt-to-ground capability. This capability requires the bogey to slide forward prior to the tilting motion. See the figure below, which shows the movable bogey and ride height settings option. The movable bogey can be used to change the load distribution between the trailer's axles and the prime mover. By positioning the bogey directly under the load's center, more weight is transferred to the trailer's axles, which prevent the prime mover's fifth wheel and axles from being overloaded. Also, when the bogey is slid forward, the turning radius is greatly reduced, increasing the trailer's maneuverability. The movable bogey is an enabler in the patent pending Fifth Wheel Trailer with Adjustable Deck (application number: 12/489,828; Summary of the Invention, paragraph 0006).



7.1.8 Powered Trailer Rollerdeck

The powered rollerdeck is a detachable kit as an option on the 34T. The rollerdeck consists of 400 Hertz (Hz) alternator, rollerdeck frame, powered rollers, powered pallet rotational system, and all the circuitry and controls to make it operational. The powered rolldeck kit mounted on the existing trailer deck top allows for easier transloading operations between the trailer and cargo aircraft. This capability was specifically tested and demonstrated at a Dover Air Force Base technical demonstration. The technology is mature, as it is equipped on many cargo aircraft. This application, however, is a new application in a much dustier and exposed environment.

7.2 MODELING AND SIMULATION:

Boeing performed limited modeling and simulation for the 40T JRaDS trailer highlighting the benefits of the advanced load-sharing suspension, but that report was internal to Boeing and we were just privy to the presentation of those findings. Later, another propriety report was produced by Boeing to verify the risks associated with raising the 34T JRaDS off-road payload to 40 tons based on USMC questions and interest. According to Boeing, the 34T trailer can perform at 40-ton load carrying capability without loss of function but at a speed on primary roads not exceeding 50 MPH.

JRaDS JCTD consisted of four operational demonstrations (OD) involving direct warfighter use (one OD served two separate units/Services), and three official and several unofficial technical demonstrations. The below table was taken from the report prepared by the Independent Evaluator and is a summary of all the technical and operational demonstrations that were assessed for the purpose of evaluating JRaDS military utility for the 40T and the 34T variants.

8 RECOVERY, TRANSPORTATION, DISTRIBUTION DEMONSTRATIONS

E Table 1 - The JRaDS JCTD Event Summary

JCTD Event[1]	Location	Time	JRaDS Variant	Operational Scenario(s)
TD 1	Aberdeen, MD	February 2010	40T RTS	MRAP Recovery
OD 1 Phase I	Fort Campbell, KY	April 2010	40T RTS	MRAP Recovery
TD 2	Aberdeen, MD	October 2010	34T LH	Helicopter Recovery
OD 1 Phase II Recovery LUE[2]	Fort Leonard Wood, MO	December 2010	34T LH	Engineer Equipment MRAP Recovery
TD 3	Dover AFB, DE	January 2011	34T LH[3]	Cargo Aircraft Interface
LUE[2]	Twenty-Nine Palms, CA	February 2011	34T LH[4]	MRAP Recovery Limited Off-Road Endurance C130 Aircraft Interface

[1] TD is a Technical Demonstration where the trailers were operated by Aberdeen personnel. OD/LUE were planned assessment events whereby Soldiers and Marines operated the trailers.
[2] JCTD Events using Marines were called Limited User Evaluations.
[3] 34T LH equipped with powered roller deck for 463L Pallets.
[4] 2 of 4 34T LH with the powered roller deck.

8.1 RECOVERY TECHNICAL DEMONSTRATION – ABERDEEN PROVING GROUND (APG), FEBRUARY 2010:

This MRAP Recovery Demonstration was the first technical demonstration with the 40T JRaDS trailer. The recovery technical demonstration team was lead by the APG's Test Manager and his operators. The test was supported by the TM team and Boeing. Aberdeen's Battle Damage and Recovery (BDAR) team led the recovery procedures. The OM, DOM and the Independent Evaluator attended.

8.2 RECOVERY OPERATIONAL DEMONSTRATION – FORT CAMPBELL, APRIL 2010:

The recoveries at Fort Campbell were performed using 4x4 and 6x6 MRAP vehicles. The Soldiers' ingenuity for performing recovery missions was allowed and they successfully recovered the MRAP vehicles using their own approaches to recovery. The Independent Evaluator recorded how the Soldiers used the equipment, and provided their feedback in his report. To recover the mired MRAP vehicle, for example, the Soldiers

Figure 31: MRAP recovery technical demonstration – APG, February 2010

used the suspension system and moveable bogey to "inchworm" the MRAP out of the mire and help the prime mover pull the MRAP out. Below is a list of performed actions and demonstrations at Fort Campbell during JRaDS JCTD Operational Demonstration event.

Action	Start Date	Duration
Training on 40T RTS	April 12	five days
Mired MRAP Scenario	April 19	one day
Overturned MRAP	April 20	one-half day
MRAP with All Tires Flat Scenario	April 20	one-half day
IED Damaged MRAP with Detached Parts Scenario	April 21	one day
MRAP Stuck in a Ravine Scenario	April 22	one-half day
Overturned MRAP Scenario	April 22	one-half day
Command Recovery Demonstration	April 23	one day

8.3 VIP DEMONSTRATION – FORT LEE, MAY 2010:

The VIP Demonstration at Fort Lee, VA, attracted more than 100 visitors with representation from PM Tactical Vehicle, JPO MRAP, PM Stryker, TRADOC, Army, USMC, Navy and Air Force staff. JRaDS demonstrations included: MRAP recovery from a mud pit in a mire factor 2 condition, recovery of a rolled-over tactical wheeled vehicle, loading a catastrophically damaged MRAP missing the front clip (engine and axle), loading the front clip (10,000 pounds) onto the trailer using the onboard crane, and using "Lift and Tow" capability with the tailgate.

8.4 ROTORCRAFT RECOVERY TECHNICAL DEMONSTRATION – APG, OCTOBER 2010.

The JRaDS TM team was the demonstration's lead organizer along with the ATC Test Manager and his team. The main audience came from the Army Aviation Group members who maintain helicopters and were very interested to see that the JRaDS trailers can load and transport damaged helicopters without major issues. The Aviation Soldiers were highly impressed with the JRaDS' smooth ride. The feedback from the event was very positive. A UH-64 hull and an AH-60, with non-existent landing gear or with flat tires, were both loaded onto the JRaDS. The 34T JRaDS, with its specialized suspension, was able to provide soft ride to the rotorcraft during transport.

Figure 32: Rotorcraft technical demonstration – APG, October 2010

8.5 34 T OPERATIONAL DEMONSTRATION – FORT LEONARD WOOD, DECEMBER 2010

8.5.1 Engineer School Loading/Off-Loading and Transport of Engineer Equipment

The following paragraphs were taken from the Independent Evaluator's Final OUA Report and summarize the demonstration scenarios used to assess the 34T LH for engineer equipment transport.

"The 34T LH prime mover for engineer transport was the M916A3. Engineer equipment transport was a process with a series of steps whereby the trailer was rigged for loading and the Soldiers attempted to safely load a piece of equipment. If the equipment was successfully loaded, the Soldiers then attempted to properly tie it down for transport using the BII chains and binders and the existing deck mounted (not side mounted) tie downs. If successfully tied down, then the load was transported over the six-mile secondary road course and returned to the staging area. The drivers were switched out after each run until all OD team members had driven it over the course. Then the equipment was unchained and offloaded."

"This was repeated until all the recommended Army engineer equipment items listed had been at least considered (the recommended equipment list was provided by the Fort Leonard Wood (FLW) Maneuver Support Center). Since it was not possible to actually assess every type of equipment, these items were identified as being within one or more of the categories below to provide sufficient data to evaluate the 34T

Figure 33: JRaDS 34T loading demo with D7G bulldozer over plywood dunnage.

Figure 34: 34T LH with deck extension outriggers deployed.

Figure 35: 34T LH with roller deck.

LH capability.

- Equipment that is likely to be transported more than other systems.
- Equipment that weighs close to the 68,000-pound 34T LH payload.
- Equipment that is difficult to load/offload due to physical size, blind spots, or configuration."

8.5.2 MRAP Recoveries – Marine Recovery School

The 34T was also evaluated by the Marine Recovery School for recovery capabilities that might be

Figure 35: JRaDS 34T recovers mired and rolled-over MRAP.

8.5.3 Positive Mired Recovery Observations

- Eighty percent of Marine LUE participants' gave a favorable opinion on the statement that, "The JRaDS LH represents an improvement over current damaged MRAP recovery systems."
- The 100K shackle and the Eliminator chain assembly were rated very highly to the point where the Marines were asking how they could get them right away for their current recovery systems.
- The wheel guides were essential to successfully loading a disabled MRAP.

Figure 36: MRAP width compared to trailer deck width.

8.6 CARGO LOADING TECHNICAL DEMONSTRATION — DOVER AFB, JANUARY 2011.

Two 34T JRaDS were equipped with a CHD. The CHD was designed as a kit that could be put on or taken off with a crane or a forklift. Even though the system performed well overall, this CHD, in its current design, would probably not be selected for a production trailer due to its high price and lack of ruggedness. A more integrated and robust solution would be a better choice. Lack of up-front funding prohibited the demonstration program from pursuing a more integrated solution. The JRaDS team also discovered that full automation on the add-on CHD kit was not necessary and raised the cost unnecessarily. The overall load master consensus from the demonstration was that the trailer is great for rolling stock, but they preferred K-loaders for cargo loading. However, when K-loaders are not available, this method is probably the next best.

Figure 37: Aircraft direct delivery: Cargo and rolling stock tech demo — Dover AFB, January 2011.

8.7 ISO CONTAINER LOADING TECHNICAL DEMONSTRATION — FORT EUSTIS, JUNE 2011.

This JRADS 34T LH trailer technical demonstration was to demonstrate self loading and self-off loading capability of the JRADS by loading two 20-foot ISO containers onto the trailer for VIPs and attendees at the Fort Eustis Turbo Transition/Port Opening Exercise. With some practice, our engineers were able to load the ISO container using the onboard BII in 9 minutes without MHE use.

8.8 MISCELLENEOUS TECHNICAL DEMONSTRATIONS

Many mini demos were performed at various unit requests. These included recovery scenarios with the Buffalo MRAP, Stryker, CH-47, Maxx-Pro MRAP, and more.

Figure 38: Stryker loading demo at APG with JRaDS 40T – 4Q FY10.

Figure 39: Buffalo loading tech demonstration.

Figure 40: CH-47 loading tech demonstration was requested by theater in response to a recovery need. The JRaDS team prepared loading procedures and sent them to OEF. An I-beam was used to extend trailer width.

Figure 41: JRaDS trailer proved capable to handle CH-47. CH-47 Boeing Engineering was brought in as experts to assist in developing recovery and loading process of this helicopter.

8.9 RECOVERY/ENGINEERING EQUIPMENT LOADING 14T TILT DEMONSTRATION — FT. LEONARD WOOD, DECEMBER 2011:

The demonstrations with the 14T TILT trailers were conducted with the Engineer School and the Marine Recovery School. The following demonstration scenarios were performed:

1. Recovery scenario one	Recover MTVR MK27 from Mire I
2. Recovery scenario two	Recover and Load unarmored HMMWV from the slope of a mud pit Mire II
3. Recovery scenario three	Recover 6x6 MRAP Buffalo (vehicle shell, only body and axles) from Mire III positioned laterally in mud pit
4. Recovery scenario four	Recover and Load MATV missing rear axle assembly, no mire
5. Recovery scenario five	Upright Rolled-Over MATV
6. Recovery scenario six	Load functional MATV with one deflated front tire
7. Army Engineer Equipment	Load, Secure, and Offload Army Battle Handover Line (BHL) and Skid-steer Forklift

Figure 42: Mired HMMWV recovery and load.

Scenarios one and two were accomplished without any complications after training and hands-on instruction. Scenario three was to dislodge a gutted Buffalo (estimated weight around 25,000 pounds) that was transversely emplaced in a ravine where front and rear axles were partially buried in the banks. The trailer was able to dislodge the vehicle. No further recovery was attempted on the Buffalo, as the Buffalo's weight exceeds that of the TILT. Scenario four was accomplished with some difficulty since the Marines were not familiar with our cribbing. Once the cribbing was set, loading and unloading was accomplished without issues. Scenario five was accomplished without issues. Scenario six was not fully completed due to wheel guides being taller than required and since the wheel guide would have made contact with the MATV's wheel control arm and could have caused damage to the otherwise fully functioning MATV. Scenario seven was accomplished with the U.S. Army. The only issue that came up was the backhoe made slight ground contact when loading and unloading. The backhoe was also tied down and transported around the parking lot.

Figure 43: Mired 6x6 Buffalo recovery.

Figure 44: Recover and load MATV missing rear axle assembly.

Figure 45: Upright rolled-over MATV.

Figure 46: Flat tire MATV recovery using wheel guides.

Figure 47: Skid steer light Army engineer equipment demonstration.

Figure 48: BHL light Army engineer equipment demonstration.

The following table (from the Summary Report prepared by the Independent Assessor) summarizes the findings for the 14T TILT to meet the Technical Demonstration objectives.

Objective	TD Findings
Recover, self-load, secure, and self-offload damaged MRAP All- Terrain Vehicles (MATVs)	Demonstrated limited operational utility in its ability to recover MATV-type casualties listed below within its payload capacity, deck dimensions, and overall winch capacity by: ▶ Recovering mired MK27 and 6x6 MRAP (stripped without power train) ▶ Recovering and loading mired HMMWV ▶ Loading MATV with missing rear axle using JRaDS skid and cribbing equipment ▶ Up-righting a rolled-over MATV ▶ Loading MATV with front flat tires

Figure 49: MATV Tow Empty 14T TILT. The unloaded TILT was towed around the demonstration sites behind the AMK36 and an unloaded MATV, at low speed on a one-half mile, mainly flat area without any apparent issues.

Since the 14T TILT had not been safety certified with the AMK36 as its prime mover, there was a major limitation in not being able to assess the transport capability once the MATVs had been loaded. The trailer's stability with relatively high center of gravity loads, such as the MATV, remains unknown, particularly when operating off hard surface roads. Overall, the Marines liked the TILT. They liked the disc brakes, the winches (suggested adding rollers), had no issues with the numbers and locations of tie-downs, liked the 6-pound snatch blocks, liked the synthetic winch ropes, but requested additional length.

9 OPERATIONAL UTILITY ASSESSMENT RESULTS

9.1 CRITICAL OPERATIONAL ISSUES (COIS)

Five Critical Operational Issues (COIs) are appropriate indicators of military utility derived from the gaps and requirements identified by the services and combatant commanders. These COIs tie into: the movement of cargo, containers, and equipment, which include transloading/cross-dock operations, deployment, sustainment, and evacuation, as well as recovery and retrograde, which cause delays in the distribution process. The five COIs and the findings that the JRaDS demonstrations were to answer, as observed by the Independent Evaluator, are presented below in the table. The COIs were answered based on 40T and 34T JRaDS variants. The findings result from the analyses of all data as performed by the Independent Evaluator.

COI	Findings
1. Does JRaDS reduce the dependency on MHE for loading and off-loading distribution nodes in the distribution architecture in austere environment?	ISO 20-foot container self loading and self-off loading on the 40T RTS and 34T LH was successfully demonstrated by ATEC as part of JRaDS performance testing. ISO 20-foot ISO containers were also successfully self-loaded and off-loaded by 101st SUS BDE Soldiers during the 40T RTS *OEF* deployment. The 34T LH with a powered roller deck successfully self-loaded and off-loaded 463L pallets from/to the ground. Due to the fact that the load/off-load processes involve sliding the container directly on the trailer deck (as opposed to using rollers), there is a potential for damaging the deck, especially with older or damaged bottom containers. For this reason, the initial Jan. 26, 2010, ATEC briefing on the process recommended using the self-load/off-load of containers only when no other CHE capability is available.
2. Can JRaDS directly interface with strategic and tactical airlift aircraft?	The 34T LH can successfully interface with C130 and C17 aircraft. The 34T LH can interface with the C5 aircraft forward ramp, but not always with the rear ramp depending on airfield topography. Slope of airfield ramp where the C5 was parked at Dover made the rear ramp too high for the trailer. "Kneeling" the C5 may alleviate this condition. The 34T LH with powered roller deck successfully transferred four 463L pallets to/from each aircraft with the following caveats: • High pallets loads (e.g., QUADCON) cannot be turned when trailer is in final position for transfer at C130 cargo ramp due to interference issues with the C130's cargo opening sides. • The requirement to back the trailer to the aircraft and turn each pallet will adversely affect load/offload cycle times. The standard 34T LH successfully demonstrated transferring rolling stock to each aircraft type. Consensus among Air Force loadmaster SMEs was that a system with this capability will not replace the current Air Force ground cargo support equipment (e.g., K-loaders, flight-line forklifts, etc.). This capability would be a tactical Army and/or Marine Corps system used on expeditionary or forward-based airfields to supplement Air Force expeditionary ground support equipment.
3. Does JRaDS expand operational capability beyond improved and substantial road networks?	Both fifth-wheel JRaDS variants operated successfully with the current fifth-wheel tactical trucks. The 34T LH off-road capability over rougher terrains was demonstrated at 29 Palms over secondary roads and trails for a distance of about 330 miles with no direct trailer related issues. The 34T LH was also demonstrated with Army engineer equipment in a transportation demo over a six-mile secondary road course without any noticeable issues. During the demo at Fort Leonard Wood, there were, however, some issues with loading and securing several types of equipment, which lead the JCTD team to several trailer modifications and lessons learned for future designs of this type of trailer, which included: • Steel trailer deck (as opposed to the wooden deck of standard lowbed trailers) with steel tracks (D7G Bulldozer) or wheels (steel wheel rollers) is too slippery for loading and would require means to increase friction • Insufficient trailer deck width for equipment wider than 120 inches (Hyec Type II and high-speed roller)
4. Does JRaDS enhance the ability to recover and transport downed/damaged combat/protection platforms and rotorcraft?	The 40T RTS successfully demonstrated operational utility to recover MRAP-type casualties within its payload capacity, deck dimensions, and overall winch capacity. The winch cables need to be observed, however, as they tend to "bird nest". The baseline 34T LH width of trailer deck at 98 inches allows no margin for error with MRAP or similar sized tactical vehicles. The 102-inch-wide 40T RTS deck is a better solution for this application. The 34T LH successfully loaded and off-loaded light-medium rotary wing aircraft (AH64 and UH60)

5. Will JRaDS result in reduced number of variants and high parts commonality compared to the current trailer fleet?	Not enough information was generated during the TD/OD events about the two JRaDS variants to make a reasonable judgment about reducing the types of legacy trailer systems. As assessed, the 40T RTS and the 34T LH had little in common, e.g., different APUs, different suspension systems, different winches and different wheels (same tires, but different wheels). The limited time for each TD/OD effort left little time for any maintenance training. Any required maintenance actions were performed by the OEM field representatives. Soldier and Marine maintenance SMEs looked at each trailer separately, but no one SME saw both systems. Therefore, insufficient information is available to base any judgment about shared maintenance requirements or procedures. This question can be better answered in a couple years when data comes back from the maintenance of the 40T deployed to Afghanistan and from the maintenance that will be performed by the National Guard as they use the trailers to perform recovery training.

9.2 OPERATIONAL DEMONSTRATION ASSESSMENT OVERVIEW

First Operational Assessment (also called Phase I OD by the Independent Evaluator) assessed the 40T RTS capability to recover, self-load, transport, and off load damaged tactical vehicles with an emphasis on MRAP vehicles at Fort Campbell, KY. Initially, Phase II was to also assess the 40T RTS capability to load, transport, off load medium to heavy engineer equipment and ISO containers at FLW. Operational contingencies (40T RTS' deployment with 101st SB to *OEF*) precluded testing the 40T RTS at FLW. For this reason, the FLW OD 1 Phase II was re-designed to assess the 34T LH JRaDS capability for engineer equipment transport and conduct an LUE to assess damaged MRAP recovery capabilities.

- OD 1 Phase II evaluated the JRaDS 34T LH capability to load, secure, transport, and offload various types of Army engineer equipment using Soldiers from the 955th Engineer Co. (Horizontal Construction).
- USMC LUE evaluated the JRaDS 34T LH capability to recover, self-load, secure, and self-offload damaged MRAP vehicles using Marine instructors from the FLW Marine Corps Detachment Vehicle Recovery Course.

9.3 MEASURES OF PERFORMANCE AND MEASURES OF EFFECTIVENESS:

The MOP and MOE were determined by the JRaDS JCTD Management team and evaluated by the Independent Evaluator. It was determined through evaluation that the team picked meaningful criteria to evaluate JRaDS effectiveness.

9.4 SOLDIER / MARINE PARTICIPANTS' OBSERVATIONS

The findings from these observations can be found in the Final Report of the Independent Evaluator referenced in Sec 14.10.

9.5 SUBJECT MATTER EXPERT (SME) OBSERVATIONS

At each testing site, noncommissioned officers, warrant officers and company grade officers were sought to provide input in areas such as operational considerations, maintenance, and specialized areas, including aircraft interface and helicopter recovery. These SMEs completed questionnaires that focused on higher-level concerns about operational employment, training and personnel impact. The questionnaires also solicited input on DOTMLPF considerations.

9.6 INDEPENDENT ASSESSMENT TEAM (IAT) OBSERVATIONS

The following observations reflect the IAT's collective thoughts to point out observed issues that need consideration for any similar follow-on system(s) designed for engineer equipment transport or a "smaller" recovery variant than the previously assessed 40T RTS.

- During the training session, one trailer, with an unsecured load, would not level during an auto-level process initiated, as per the training, immediately after bringing the tilt bed to the horizontal. The system kept trying to further lower the trailer's driver's side to the point where the load was in danger of tipping off the trailer deck. Attempts to stop it by disengaging the auto-level and hitting the emergency APU stop failed. The APU was finally able to be shut down manually before any injury or load damage. The (emergency stop) problem was traced by Boeing to a bad APU fuse (circuitry), exact circumstances of the specific suspension settings at the time, and the lack of a pre-programmed software update. Points to a need for a manual backup system or the ability to override any auto system.
- Engineer equipment transport requires a wooden (or similar surface) deck for traction when loading steel tracked or wheeled equipment and as a sacrificial surface since steel tracked equipment tends to gouge and tear decks.
- Using a system only rated for a 34T payload will preclude moving some current engineer equipment (see comments on Hyec Type II), but also has future impacts as more equipment is up-armored. The 40T payload of current M870 series lowbed trailers has to be matched, if not increased.
- Consideration should also be given to maintaining the M870 series' 102-inch width. This gives a small margin for error when loading equipment without having to deploy deck extensions. (The 34T JRaDS width was specifically designed to stay within the maximum width requirement for NATO countries to eliminate need for permits related to width.)
- The deck extension system could be modified to reduce deployment time to desired 10 minutes and still provide traction and sacrificial characteristics, and the ability to drive on when tilted.
- The winch cable's inherent tendency to bind and bird nest during winching operations on the 40T was overcome by new winch design for the 34T JRaDS, adding simplicity to operations but also cost and weight.
- The 34T LH suspension performed well and shows potential, but it was not run on severe off-road terrain typical of current operational conditions for extended time and the durability of such system was not verified. The preponderance of hydraulic and electronic systems is susceptible to the rough ground (especially "washboard"), temperature extremes, dust, river fording, etc., typical of operations in Third World or limited infrastructure areas.

10 TEST RESULTS

Testing Authority at the ATC was given by the U.S. Army Developmental Test Command (DTC) to plan, conduct, and report the Automotive Safety and Performance Test of the JRADS trailers under ATEC Project No. 2010-DT-ATC-JRADS-E6092.

10.1 40T TRAILER:

After government signoff in Calumet, MI, four JRADS 40T RTS Trailers were delivered to ATC at the Aberdeen Proving Ground (APG). All four trailers were run through a battery of tests to determine their compliance to the stated requirements in the areas of endurance, human factors, environmental, transportability, safety, and automotive performance. The tests were conducted with several military prime movers. The JRADS 40T trailers were tested for compatibility with the M916, M983A2 (LET), M1070 (HET), USMC LVS, and USMC LVSR. This section provides a brief summary of the test results. For additional information, the full test report is available: ATC Final Automotive Safety and Performance Report for the JRADS 40T RTS Trailer System from January 2012 (Report No. ATC-10794)

Vehicle Characteristics for 40T RTS Model:

- Vehicle curb weight (VCW): 25,786 kg (56,850 pounds)
- Payload, primary roads: 36,287 kg (80,000 pounds)
- Payload, cross-country: 23,587 kg (52,000 pounds)
- Gross vehicle weight (GVW), primary roads: 62,074 kg (136,850 pounds)
- Dimensions: Length: 17.7 meters (58 feet), width: 2.6 meters (8.5 feet), deck height: 1.1 meters (3.6 feet (nominal))

10.1.1 Recovery and Distribution

Both recovery and distribution were analyzed with the 40T at APG. The distribution testing was performed with a CROP, a 20-foot ISO container. Other distribution testing performed was loading with some commonly used engineering equipment to include a road grader, a front bucket loader, and a vibratory roller.

The following summarizes ACT testing of the 40T JRADS RTS Trailer in combination with USMC Truck Tractors per ATC Report Number ATC-10794 of February 2012.

SUBTEST	COMPLIANCE	REMARKS
Initial Inspection (para 2.1)	Met	All systems could alternately accept commercially available synthetic lubricant. RTS tires and rims were identical at all wheels. Vehicle lug nuts on all wheels were accessible without removal of other items. RTS was equipped with external compartments for secure storage of BII.
Vehicle Characteristics (para 2.2)	Met	RTS' physical characteristics in combination with the LVS and LVSR were measured at CCW and GCW. The static rollover threshold of each combination at GCW was measured. Each combination was capable of performing a 90-degree jackknife maneuver without interference between the tractor and trailer.
Gradeability and Side Slopes (para 2.3)	Met 20 percent grade	LVS/RTS and LVSR/RTS combinations, both at GCW, performed satisfactorily on grades up to and including 20 percent (threshold). Both combinations were able to hold on the 20-percent grade with the parking brakes, then the service brakes, engaged. Both combinations performed satisfactorily on the 20-percent side slope at GCW.

Braking (para 2.4)	Met	The RTS performed maximum effort brake testing with both combinations at GCW. The RTS was equipped with a self-adjusting air brake system. The ABS functioned when connected with both tractors.
Steering and Handling (para 2.5)	Met	LVS and LVSR steering and handling testing in combination with the RTS at GCW. Both combinations exhibited roll and yaw stability at all speeds safely tested.
Endurance (para 2.6)	Met	LVSR/RTS combination successfully completed 1,609 km (1,000 miles) of paved, secondary, and cross-country roads. There were no operational mission failures and any failures that occurred were correctable at the operator level.
Storage Compartments	Met	The RTS was equipped with external compartments for secure storage of BII.
Final Inspection (para 2.7)	Partially met	The RTS and all of its components were in good, operational condition. A hub-bearing seal leak could not be repaired due to a lack of spare parts. The first axle, left side, inner and outer tires were both worn, but not replaced because they were still usable.

Endurance test procedures were developed in accordance with TOP 2-2-506 (ref 1c). The prime movers used JP-8 fuel. The 2,414 km (1,500 miles) of endurance operations were conducted as presented in Table 1.

The 2,414 km were completed at CCW and GCW.

40T RTS - MISSION PROFILE, TRACTOR/RTS COMBINATION			
TEST COURSE	COURSE, percentage	TOTAL, km	TOTAL, miles
Paved	20.0	483	300
Secondary Roads	47.5	1,146	712
MTA BB/G	15.0	362	225
PTA-A	15.0	362	225
CTA-C	17.5	422	262
Cross-Country/Trails	32.5	785	488
PTA No. 1	20.0	483	300
PTA No. 2	6.25	151	94
PTA No. 3	6.25	151	94
Total	100.0	2,414	1,500

10.2 34T TRAILER:

After government signoff in Calumet, MI, four JRADS LH 34T trailers were delivered to the ATC. All four trailers were run through a battery of tests to determine their compliance to the stated endurance, human factors and safety, transportability, and automotive performance requirements. Recovery and distribution testing was also performed with both the plain deck and CHD/crane LH34Ts. The trailers were run through the tests with several military prime movers. The JRADS 34T trailers were tested for compatibility with the M915, M916, M983, USMC LVS, and USMC LVSR. This section presents a brief test result summary. For more information, the full test report is available: ATC Final Automotive Safety and Performance Report for the JRADS 34-T LH Trailer System from January 2012 (Report No. ATC-10684)

The following is a summary of ATC's Automotive Safety and Performance Test for the JRADS 34T Trailer Report of January 2012. For more detail, see Report No. ATC-10684.

SUBTEST	COMPLIANCE	REMARKS
Initial Inspection	Met after modification	Initially not sufficient storage area for all necessary equipment, but met after trailer was modified.
Vehicle Characteristics and Compatibility	Met 20 percent threshold, did not meet 30 percent objective	All wheels on the LH34T did not remain on the tilt table up to a 30-percent side slope. When coupled to the M915A2: The M915's low fifth-wheel height results in trailer landing gear to be close to the ground, producing a steep deck angle and causing trailer's end to be abnormally high, thereby causing the LH34T's kingpin to jam in the M915's fifth wheel.
Gradeability and Side Slopes	Partially met	The 20-percent longitudinal grade operation requirement was considered met by all combinations tested except the M915A2/LH34T.
Braking	Met	Self-adjusting, 100-percent air brake system. Antilock brake system (ABS). Emergency brakes engaged when system air is depleted. Equipped with tools to manually override the brakes in the event of air loss.
Steering and Handling	Met	Exhibited roll and yaw stability at all speeds tested.
HFE and Safety	Partially met	Device control levers (winch, landing legs) could be easily confused. Ladders did not provide adequate foot clearance and did not satisfy the minimum width requirement.
Transportability	Partially met	LH34 equipment tie-down provisions did not meet standards. Equipment lift points did meet standards. The cargo provisions did not meet standards; however, provisions were relabeled for de-rated load. Tested and passed to those loads.
Winching	Partially met	Both winches were able to attain stall pulls greater than the criterion and rated capacity. Both winches in tandem and with their snatch blocks were able to pull the required 63,503 kg (140,000 pounds) However, attachment point back to the deck damaged the deck.
Crane	Partially met	The hoist winch lifted 1,134 kg (2,500 pounds) at 3 meters (10 feet) from the centerline of the crane at low and high speeds. The boom was unable to lift the load at either speed.
Recovery and Distribution	Partially met	The Buffalo and MRAP All-Terrain Vehicle (M-ATV) were driven onto the deck to assess the trucks and trailer compatibility. The LH34T was able to self-load and offload an AH-64 Apache (flat tires, bad landing gear) and the shell/chassis of a UH-60 Black Hawk helicopter. The LH34T was able to self-load and off-load two 20-foot ISO containers sequentially with minimal damage to deck. The LH34T was able to self-load and off-load two CROPs sequentially; with some damage to the load equipment. Engineering equipment compatibility was checked and determined to be able to recover various engineering assets. Provides electrical and hydraulic power and air to operate tools.
Endurance	Met	Completed three cycles of 1,609 km (1,000 miles) unloaded and 1,609 km loaded on paved, secondary, and cross-country roads. None of the mileage was accumulated with a 34-ton load on the trailers due to prime mover limitations.
Final Inspection	Met	The test items were in good condition following testing.

10.3 14T TRAILER:

14T TILT testing was performed by Nevada Automotive TEST Center (NATC).

SUBTEST	COMPLIANCE	REMARKS
Lifting and Tie-downs	Met	The test article met the lift provision requirements of MIL-STD-209K. The test article met the MIL-STD-209K equipment tiedown requirements.
Emergency Brakes	Met	Releasing without air assist however required ¾-inch wrench, which was not supplied in the BII kit.
Brake Testing	Not conclusive	Not performed on the prime mover alone, but the combination did not meet FMVSS 121 stopping distance requirement. The stopping distance for the combination exceeded required stopping distance between 20 and 40 percent at target speeds from 20 to 50 mph.
Controls and Displays, Data Plates, Markings Evaluation	Not met	
Double Lane Change Maneuver Test	Met	No adverse handling or tracking issues were noted with the HEMTT prime mover and TILT combination during the double-lane-change maneuver. The HEMTT ATPD states that it should traverse a double-lane-change test course on a level paved surface at 35 mph without a towed load attached. The TILT did not reduce the HEMTT's double-lane-change capabilities. The speeds achieved in each direction through the double-lane-change course were 35.4 (turning left, then right), and 38.7 (turning right, then left).
Side Slope Test	Met	The HEMTT prime mover and TILT combination completed the 30-percent side slope event without any instability or handling issues noted.
Illumination	Met	FMVSS 108 requirements
Steering and Handling	Met	
HFE Inspection	Met	Risk assessment is low to medium
HFE Safety	Met	Risk assessment is low to medium
HFE Noise Test	N/A	Not assessed
HFE Field of View	Partially met	
Transportability	Met by analysis, but not verified.	Internally transportable in C-130, and externally transportable by CH-47 at all given elevations and temperatures listed in MIL-STD-1366E.
Winch Test/Maximum Rated Capacity (18,000 pounds each)	Rated capacity not met during testing	Did not achieve target loads. Later, the winches were modified and performed better but were not fully tested again.
Recovery (Basic and Power)	Partially met	The recovery scenarios were partially met with the available test vehicles and in selected configurations. The winch cable's steep angle when connected to FMTV prevented the full loading due to winch cable abrasion and the test being discontinued. Having only one front flat tire made it impossible to load the vehicle without the aid of a wheel guide. This was later attempted with wheel guides but the wheel guides that were used for this were too tall and this capability was not verified with TILT. (We were successful doing this operation with other JRaDS trailers and given the ability to modify believe it could have been accomplished.)
Road Edge Recovery	Met	
V-Ditch Testing	Partially met	Capable of traversing, but had some issues with tire touching trailer bed and front tires deflecting and steering outward.
Rail Impact Test	Met	
APU Power Requirement	Met	
Durability Test (1,500 miles) Planned Completed (384.2)	Partially met	1,500 miles: Primary road – 225 (5.1) miles at 50 mph; secondary road – 375 (107.5) miles at 25 mph; Cross Country – level – 150 (28.5) miles at 15 mph; Cross Country – Hilly – 750 (243.1) miles at 22 mph. Front Shock absorbers developed Class III leaks, weld failure on rear suspension cross member, roller/plunger on hydraulic sensor was damaged, crack in front and side lower bed frame, tire contact on bed frame, frame and pin movements. UTT made necessary repairs before shipping to our operational demonstration site.

Figure 50: HMMWV recovery with both front tires flattened with TILT trailer.

Figure 51: Double-lane-change maneuver test configuration was conducted with the HEMTT M977.

Figure 52: Side slope test configuration using U.S. Army Test Operations Procedure (TOP) 2-2-610 as a guide.

10.4 RE-TESTING AFTER IMPLEMENTATION OF UPGRADES

Both 40T JRaDS and 34T JRaDS were retested at APG after all the upgrades and maintenance were completed and prior to deployment or transition of trailer assets to the end user and found to be mission ready. The TILT trailer underwent necessary repairs at the test site prior to our operational demonstration with the Soldiers and Marines. However, the proposed modifications were not implemented on the TILT trailer due to lack of funds and lack of certainty that the trailer will be transitioned to a future user.

10.5 TEST INCIDENT REPORTS (TIRs)

TIRs were generated at APG during trailer testing. Majority of issues were related to winch tensioners and hydraulic misfunctions and these were either repaired or if needed modified on all trailers.

FUNDING SUMMARY

The functional cost estimate for the JRaDS JCTD proposal totaled $22.2 million to develop, manufacture, test, demonstrate, analyze and transition JRaDS. The budget allowed for Extended Use and Sustainment for Residual Trailers estimated at $250,000 per year for (OMA Funds) FY12-15, with a total cost of $1 million for the four-year period. The residual funding was not approved and support for residuals was transferred into the gaining unit's hands. The JRaDS JCTD produced 10 trailers (eight through Boeing and two through UTT) to conduct technical and operational demonstrations. Not included in the below table, which is the summary of final funding by FY and funding source, are the DINK (dollars in kind) money for the RTS and the plus-up money that paid for the TILT:

Funding ($ millions)	FY09	FY10	FY11	TOTAL
Army (PM-TV)	0	1.485	1.668	3.153
Army (TARDEC)	1.411	1.238	0.486	3.135
USTRANSCOM	0.450	4.025	1.291	5.766
USMC	0	2.155	0.250	2.405
DLA	0.100	0.100	0	.2
OSD	2.0	2.5	1.244	5.744
Total	3.961	11.503	4.939	20.403

12 CONTRACTS

JRaDS work was implemented under five contracts. Two contracts with Boeing: one through JPO MRAP and one through TACOM, one between TACOM and CTC for the TILT trailer development, one between TACOM and NATC for evaluation by an Independent Assessor, and one between TACOM and WTSI/Primus for various field support that was not covered by other contracts.

12.1 BOEING

The main two contracts were: one for four 40T RTSs through the JPO MRAP Office in Stafford, VA, and the other through TACOM with TARDEC, as the COR, for the four LH 34T trailers. Both of these contracts had several modifications that added work and number in deliverable trailers.

12.1.1 Through JPO MRAP:

Contract M67854-09-C-5102 was signed on June 3, 2009.

12.1.2 Through TACOM:

Contract W56HZV-09-C-0611 was signed on Sept. 28, 2009.

12.2 CONCURRENT TECHNOLOGIES CORPORATION/Utility Tool and Trailer Corp.

Contract W56HZV-06-C-0459 was signed September 2009.

12.3 WORLD TECHNICAL SERVICE INC. (WTSI)/(LATER PRIMUS)

Contract W56HZV-06-C-0406, Mod P00077 added support to JRaDs testing and operational demonstrations.

12.4 NEVADA AUTOMOTIVE TEST CENTER (NATC)

Contract with NATC, W56HZV-09-C-0669 was signed Sept. 28, 2009.

13 AGREEMENTS AND MATRIX SUPPORT

There were several signed agreements during the JRaDS Program execution.

13.1 MAJOR AGREEMENTS

The Implementation Directive was a program starter with very high visibility to the two-star level. More on this is in the Reference Section of this report. The next major internal agreement between JPO MRAP and JCTD Management Team was signed by TARDEC TM and the JPO MRAP for follow-on work after trailers were bought and delivered to the JRaDS JCTD management team.

13.2 PM SUPPORT

PM HTV and ASV alternated as our matrix support for the efforts related to Transition Management.

13.3 TEST, TRAINING AND DEMONSTRATION SUPPORT

ATEC was tasked to do trailer testing for the Boeing manufactured JRaDS trailers. To perform recovery demonstrations BDAR was part of our team to plan and oversee execution of all the recovery operations and also served as a safety officer. TARDEC's New Equipment Training office coordinated JRaDS equipment training for Soldier prior to trailers' demonstrations.

13.4 EQUIPMENT LOANS

Most trucks needed to test with were acquired as equipment loans. These loans were signed as agreements for the duration of testing. ISO container loans were used both for testing and for storage of equipment at our test site.

13.5 EXTENDED USE TRANSFERS

After demonstrations were completed, several units requested JRaDS trailers for extended use. These requests resulted in signed agreements. The 40T JRaDS was sent to Afghanistan through a "MON for UMR of the JRaDS 40T Trailer". The 34T JRaDS residuals were transferred to National Guards through MOAs with TARDEC.

14 REFERENCES

Below are references, some with short summaries, of the JRaDS JCTD Program's documents and events presented from the TM's point of view. These references could become available for further study upon request to this report's author.

14.1 JRADS IMPLEMENTATION DIRECTIVE, DECEMBER 2008

The primary goal of this Implementation Directive (ID) is to define the JRaDS JCTD program, its objectives and approach, roles and associated responsibilities of each JRaDS JCTD Manager, program schedule and resources of key participating organizations. The following offices signed the ID: Deputy Under Secretary of Defense, Deputy Commander for TRANSCOM, Commanding General, Marine Combat Development Command, Vice Commander, Air Mobility Command, Deputy Assistant Secretary of the Army for Research and Development, U.S. Army Commander, U.S. Army CASCOM, Major General, GS Director Force Development, Director, Tank Automotive Research Development and Engineer Center, PEO CS&CSS, Deputy Director Logistics Operations and Readiness DLA, Director, Force Projection and Distribution Headquarters, Department of the Army, G-4.

Although not part of the ID, a separate MoA document was signed between the TM and the JPO MRAP office in Stafford, VA, which identified JRaDS JCTD as the party responsible for testing JRaDS assets, while the JPO MRAP office funded 40T JRaDS variant manufacturing.

14.2 MOU – STATEMENT OF UNDERSTANDING BETWEEN JPO MRAP AND JRADS JCTD MANAGEMENT TEAM, DEC. 8, 2008

This document established a mutual understanding between JPO MRAP and JRaDS JCTD Management Team in relation to the JRaDS MRAP variant trailers. The document provided an understanding on how the 40T JRaDS trailers were funded and supported throughout the JCTD. While the four 40T JRaDS were purchased by JPO MRAP, the remaining JCTD functions were funded by the JCTD Management Team. The MOU was signed by: Deputy Program Manager, Joint MRAP Vehicle Program, TM JRaDS JCTD, USATARDEC, OM JRaDS JCTD, USTRANSCOM J5/4-AI

14.3 CONOPS – TRANSCOM, JULY 2011

The CONOP's purpose is to describe how JRaDS could be used throughout DoD's distribution architecture to improve warfighter support by improving distribution throughput, reducing reliance on MHE assets, enabling more effective recovery/retrograde of downed/destroyed cargo/equipment and by increasing equipment availability through minimal number of variants, increased commonality of parts, including diagnostic and prognostic technology, and reducing maintenance down-time.

14.4 DETAILED TEST PLAN (DTP) AUTOMOTIVE SAFETY/PERFORMANCE TEST JRADS 40T RTS, U.S. ARMY ATC, NOVEMBER 2009,

The JRaDS TM was responsible for assisting in the creation and coordinating the approvals for the detailed test plan. The TM worked with her team and the ATC test community and the JRaDS Management team to select the right test objectives to support future operation demonstrations.

14.5 TEST REPORTS, ATC FOR JRADS 40T

14.6 TEST REPORTS, ATC FOR JRADS 34T

14.7 TEST REPORT, NATC FOR JRADS 14T TILT

14.8 BUSINESS CASE ANALYSIS, LMI UNDER TRANSCOM OVERSIGHT, MAY 2011 - INCOMPLETE

I consider the BCA incomplete as it did not consider multi-mission capability of JRaDS. This can be attributed to the lack of supporting data for other legacy equipment that was demonstrated transportable or was recovered efficiently with a single JRaDS trailer and a truck. Our contractor's limited BCA compared the use of JRaDS trailers to current processes using legacy trailers. The findings were that JRaDS efficiency was considered insufficient to overcome the initial acquisition price. The study compared the use of a crane and two lowboy trailers for a recovery of a helicopter, for example, to the same work performed by JRaDS with a truck. In this scenario the incompleteness is in the omission of using the cost of acquiring a crane. The report states: "Our helicopter recovery scenario analysis is incomplete in that we could not obtain sufficient information on the LRT 110 crane. The FEDLOG purchase price is questionable, and we could not obtain operating and maintenance cost data for the hours that the crane is used at the recovery site. When we calculated the difference in operating and maintenance costs for the two equipment sets, we had to omit the crane. Because of this, we know that the actual JRaDS efficiency will be slightly greater than what we calculated, but we do not know by what amount. Still, with an acquisition price of $225,000, the payback ratio is unreasonable." The stated crane is insufficient for Apache or Blackhawk helicopter recovery (which we demonstrated successfully at APG with JRaDS) and any crane with the right capacity would add at least $100,000 to the cost of the legacy oprations.

The final decision for the cost comparison was made between two systems: JRaDS and Interim Stryker Recovery System (ISRS) and it showed JRaDS to be more expensive based on acquisition cost. This cost comparison, partially, resulted in ISRS being preferred for the PoR. The contractor did give non-quantifiable benefit to JRaDS stating that "the non-quantifiable benefits of using JRaDS are based on its operational characteristics. These benefits are qualitative or intangible. These benefits cannot readily be assigned a financial dollar value. An example is minimizing the exposure of forces to hostile threat. The perceived value of these benefits may influence acquisition decisions more than any quantifiable benefits, when compared to the JRaDS per-unit cost."

Another omission in the comparison to ISRS was the fact that JRaDS could recover up to Category III catastrophically damaged MRAP, while ISRS can only recover up to Category II.

14.9 TECHNICAL TRANSITION AGREEMENT (TTA) FOR JRADS, OCT. 7, 2010

TTA was signed by JRaDS JCTD Managers, Army G8-FDT Deputy, and JCTD Program Director. Agreement highlights state that if the JCTD demonstrations/assessments are successful, and/or positive feedback is received from users in Afghanistan, then the Army has shown intent to POM in the Fiscal Year Defense Plan for corresponding year. Further stating that the transition from JCTD to a PoR, PEO CS&CSS, will happen upon successful completion of Milestone B. The XM, here PEO CS&CSS, will develop a transition plan to facilitate JRaDS acquisition. Transition will be based upon the requirements of Milestone B entrance criteria, an approved CDD, coupled with full funding in the Fiscal Year Defense Plan for the required program elements.

14.10 OPERATIONAL UTILITY ASSESSMENT REPORT, INDEPENDENT ASSESSOR, NATC, MAY 2011

Operational assessment summary for testing that was conducting at the NATC on the 34T and 40T trailers. The IA details findings for the five Critical Operational Issues and Soldier/Marine participant observations and recommendations.

14.11 SAFETY CONFIRMATION FOR JRADS 40T IN SUPPORT OF UMR – DTC TEST MANAGEMENT, DECEMBER 2010

This DTC Safety Confirmation's information is based on testing results conducted by ATC and referenced documentation review. MIL-STD-882D definitions were used to assign the hazard severity and occurrence probability. Risk Assessment Codes were assigned in accordance with guidelines given in AR 70-1 (reference 1b). The DTC Safety Confirmation was issued for the RTS for use in support of UMR to *OEF*.

The overall RTS operation's risk was considered low provided mitigations identified in the document were followed.

14.12 SAFETY RELEASE FOR JRADS 34T IN SUPPORT OF TRANSFER OF TRAILERS TO MICHIGAN NATIONAL GUARD SIGNED BY DIRECTOR OF TEST MANAGEMENT, APRIL 2012

14.13 CAPABILITIES AND LIMITATIONS REPORT FOR 40T, ATEC, JAN. 20, 2011

This report provides a rapid JRaDS 40T RTS capabilities and limitations assessment. The report provides warfighters with information, limitations and recommendations for theater use. It also provides useful information to the acquisition authority and materiel developer for further system development.

14.14 TECHNICAL DEMONSTRATIONS – APG, FEBRUARY 2010, OCTOBER 2010, DOVER AFB, JANUARY 2011, FORT LEONARD WOOD, DECEMBER 2011

14.15 OPERATIONAL DEMONSTRATIONS – FORT CAMPBELL, APRIL 2010

14.16 OPERATIONAL DEMONSTRATIONS – FORT LEONARD WOOD, DECEMBER 2010

14.17 OPERATIONAL DEMONSTRATIONS/LIMITED USER EVALUATION (LUE) – 29 PALMS, FEBRUARY 2011

The JRaDS 34T LH JCTD Operational Demonstration at Fort Leonard Wood, MO, had two separate evaluations:

OD 1 Phase II evaluated the JRaDS 34T LH capability to load, secure, transport and offload various types of Army engineer equipment using Soldiers from the 955th Engineer Co.

Marine LUE evaluated the JRaDS 34T LH capability to recover, self-load, secure and self-offload damaged MRAP vehicles using Marine instructors from the Marine Corps Vehicle Recovery Course.

After completing all the planned events for each evaluation, the IAT conducted a "white board drill". The drills had the primary Soldier OD and Marine LUE participants meet in a group session to discuss the 34T LH based on their 34T LH training and operational experiences during the OD/LUE.

All Soldiers and Marines who functioned as either equipment operators or recovery specialists answered questions from the following categories:

1. What the Soldiers/Marines believed needs changing on the 34T LH as they evaluated it if they knew the system as they saw would be fielded within a year.
2. 34T LH capabilities they considered essential for any similar system (not necessarily the 34T LH they evaluated) that would be fielded at some future date.
3. Other capabilities they would like to see on any future similar system based on their operational experience.

14.18 AOR AFG RESIDUAL DEMONSTRATION, JANUARY 2011 to PRESENT

14.19 TEST INCIDENT REPORTS FOR 40T AND 34T JRADS TRAILERS

14.20 CAPABILITIES AND LIMITATIONS REPORT FOR 34T, ATEC, DECEMBER 2011

14.21 MRAP VEHICLE RTS TRAINING MATERIALS, FEBRUARY 2010

Document contains JRaDS MRAP-RTS training materials, which are intended to provide ATC test personnel with necessary understanding of MRAP-RTS functional operation to complete the safety confirmation and endurance trailer and its associated equipment testing.

14.22 COMPLIANCE MATRIX, SEPTEMBER 2009

Document lists standard capabilities and requirements that current recovery trailers meet and whether or not the JRaDS trailer complies with these standards.

14.23 MEMORANDUM OF NOTIFICATION AND REQUEST FOR ACCEPTANCE OF CONDITIONS FOR AN URGENT MATERIAL RELEASE OF THE JRaDS 40T TRAILER SYSTEM FOR RECOVERY OF MRAP VEHICLES.

The purpose of this Memorandum of Notification (MoN)/Materiel Fielding Memorandum is to announce that the PM MRAP intends to field JRaDS 40T RTS to your COMMAND. The PM requests USARCENT concurrence for this MoN for the JRaDS 40T RTS. This MoN provides a brief JRaDS 40T description along with fielding information, supportability, limitations and safety concerns.]

14.24 SUMMARY REPORT FOR THE 14T TACTICAL LOGISTICS TRAILER (14T TILT) TECHNICAL DEMONSTRATION AT FORT LEORNARD WOOD, DEC. 5 - 8, 2011, INDEPENDENT ASSESSOR, NATC, FEB. 3, 2012

This technical demonstration assessment summary was conducted by the NATC. Soldiers' and Marines' observations and suggestions for this type of trailer are recorded in this report along with summary of all observed issues and findings.

14.25 METALLURGICAL ANALYSIS OF JRADS DECK MATERIAL, TARDEC, RDTA-DP-CGVDI (METALLURGICAL LAB), AUG. 23, 2011

The analysis concluded that the sample (JRaDS trailer deck piece that broke off the trailer's drivers' siderear corner) met all ASTM A 514, Grade B requirements. The failure may be attributed to a bending load in excess of 110-130 ksi, the minimum tensile strength required in Table 2 of ASTM A 514 for any grade.

14.26 IMPROVING REAR VISIBILITY STUDY:

During our demonstrations, the JRaDS team noticed that, at times, the lack of visibility while equipment loading was somewhat problematic. As an opportunity within TARDEC presented itself, the TM team worked with Embedded/Distributed Simulation Team to try to evaluate if a high-tech camera would improve visibility while loading equipment or cargo. The study concluded that a closed-circuit television camera mounted on a magnetic mount with a connection via wire to the Soldier's remote control box providing a portable display and running off of battery power could, at times, be useful. However, the feasibility of its usefulness was not calculated and this capability was not provided.

14.27 FY 2011 RAPID FIELDING PROJECT TRANSITION SUCCESS STORIES:

OSD RFO had this to say about this JCTD while closing the program:

> *"PROJECT SUCCESS /WARFIGHTER RELEVANCE: The JRADS JCTD was initiated for TRANSCOM to address COCOM gaps in cargo trans-shipment, inter-modal transfer, delivery to forward deployed/dispersed forces and recover and evacuate disabled TWVs and light-to-medium-weight rotary wing aircraft from hostile, forward areas. JRADS demonstrated a unique heavy equipment recovery trailer system to support 24-hour, fort-to-fighter, precision logistics delivery distribution system for sustaining combat power. Compared to previous recovery methods, the JRADS trailers demonstrated faster recovery of heavy equipment and vehicles, particularly Mine-Resistant Ambush-Protected (MRAPs) vehicles, weighing as much as 40 tons. Another trailer variant from the JCTD, the 34-ton LH trailer reduces the MHE footprint and speeds up the defense supply chain. The LH trailer can interface directly with aircraft, unload 20 and 40 foot containers, without a crane or forklift, and deliver cargo to a point of need. JRADS operationally demonstrated three trailer systems, called 40-ton Recovery Trailer Systems, in Afghanistan since January 2011. Fourth 40-ton JRaDS*

trailer was delivered to Afghanistan in late 2011 to assist with recovery missions. The four 40-ton Recovery trailer Systems have been refurbished prior to deployment to Afghanistan. JRADS remains in operational use and Army and Marine Corps have submitted ONS/Urgent Needs Statements for a total of 124 systems. Currently only a handful of these were validated through an ONS. These requests are in coordination at the Service-level for decision on quantity to be procured and resourced."

15 GLOSSARY OF TERMS AND ACRONYMS

101ST SUS BDE — 101st Sustainment Brigade

ABS — anti-lock braking system

ACTD — The Advanced Concept Technology Demonstration program was the predecessor to the JCTD Program. It was initiated in FY95 and was replaced by the JCTD program in FY06.

AED — Assessment Execution Document

AFG — Afghanistan

APG — Aberdeen Proving Ground

APU — Auxiliary Power Unit

ATC — Aberdeen Test Center

ATEC — Army Test and Evaluation Command

BCA — Business Case Analysis is a tool that can be used to support planning, decision-making and transition.

BDAR — Battle Damage and Recovery

BHL — Battle Handover Line

BII — Basic Issue Items

CASCOM — Combined Arms Support command

CASSI — Concepts, Analysis, System Simulation and Integration

CDD — Capability Development Document is part of the JCIDS process and provides operational performance attributes and measurable/testable capabilities to support the system development phase of a materiel solution by the acquisition community.

CENTCOM — Central Command

CHD — Cargo Handling Deck

CHE — Cargo Handling Equipment

COCOM — Combatant Command is a joint military command composed of forces from two or more services and is organized by geographical or functional areas.

COI — Critical Operational Issue is a key operational effectiveness or operational suitability issue that must be examined during demonstration to determine the system's capability to perform its mission and provide operational utility.

CONOPS — Concept of Operations is a document describing the characteristics of a proposed system from the viewpoint of a user. A description of how a set of capabilities may be employed to achieve desired objectives.

COTS — Commercial-Off-The-Shelf is software or hardware that is ready-made and available for sale, lease, or license and can be an alternative to government funded development.

CPD — Capability Production Document is part of the JCIDS process that supports the decision necessary to start the Production & Deployment Phase of a system acquisition program.

CROP — Containerized Roll-In/Out Platform

CS&CSS — Combat Support and Combat Service Support

CTC — Concurrent Technologies Corp.

DAU — Defense Acquisition University is a military training school that trains DoD personnel in the fields of Acquisition, Technology and Logistics, including Leadership and Program Management. They support JCTD training.

DINK — Dedicated in-Kind are resources (materiel or personnel) other than cash a JCTD partner can commit to the execution of a JCTD. An example would be the Air Force providing an aircraft that will be used during the demonstration of an airborne sensor.

DLA — Defense Logistics Agency

DoD — Department of Defense

DOM — Deputy Operational Manager supports the Operational Manager of a JCTD.

DoT — Department of Transportation

DOTMLPF — Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities is the process used to determine the best solution to a warfighter need. Since cost is a major factor in such determinations, a materiel solution is often the least desirable if a non-materiel solution exists. Therefore, it is first determined if any other possible change is able to meet the warfighter's needs instead of a new acquisition program (see DoD 5000).

DTC — U.S. Army Developmental Test Command

EU — Extended Use relates to the residuals from a JCTD. At the end of a JCTD, products (residuals) are often left in the hands of the warfighter. The use of these residuals by the Warfighter is called extended use.

F3T — Future Force Family of Trailers was CASCOM – Mobility Division's vision for the next generation of military trailers. The F3T was envisioned to meet the current Operational User Requirements in addition to filling current capability gaps. The JRaDS TM team based the JRaDS requirements on the F3T / NSFT data provided by CASCOM.

FEA — Front End Analysis

FLW — Fort Leonard Wood

FMTV — Family of Medium Tactical Vehicles

FOS — Family of Systems

HEMTT— Heavy Expanded Mobility Tactical Truck

HET — Heavy Equipment Transporter

IA/IE — Independent Assessor/Evaluator

MOEs and **MOPs** — The IA takes an active role in planning the demonstrations, generates the questionnaires, and organizes/facilitates the white-board drills with Warfighters at the operational demonstration/exercise's end. The IA is responsible for analyzing the Warfighters' feedback and for generating reports.

IAP — Integrated Assessment Plan provides the plan for how integrated technologies and operational concepts will be assessed.

IB — Integrated Baseline is a plan that depicts (for a specified allocation of funding over a specified period of time): (1) tasks to be performed (2) the beginning and ending dates for each task (3) expected cost associated with the performance of those tasks (4) the cost of those tasks allocated in a specified frequency (monthly, quarterly, etc. (5) a, expected costs summary.

ICD — Initial Capability Document is a part of the JCIDS process that defines capability gaps and recommends if a material solution should be considered to mitigate the gap(s). The ICD supports an analysis of alternatives and is the foundation for future capability documents.

ID — Implementation Directive serves as an agreement between the participating organizations to commit resources to the execution of a JCTD. It's signed by the primary partner organizations in the JCTD and is a required document at the beginning of a JCTD.

ISO — International Standards Organization

JCIDS — Joint Capabilities

JCTD — Joint Capability Technology Demonstration is a type of accelerated acquisition program to quickly build, test, demonstrate and possibly transition mature technology for military use. The Naval Postgraduate School is financed to perform BCAs for the JCTD Program.

JFCOM — Joint Forces Command

JPO — Joint Program Office

JRADS — Joint Recovery and Distribution System

JROC — Joint Requirements Oversight Council supports the acquisition review process by reviewing and validating JCIDS documents. It is chaired by the Vice Chairman of the Joint Chiefs of Staff and its members include the Vice Chiefs of each military service. In addition, The JROC charters the JCBs and validates JCTD candidates prior to final approval by the USD(AT&L).

JS — Joint Staff are military leaders from each service who advise the civilian government. The JCIDS is managed by the JS.

KIMS — Knowledge Information Management System is the system used to submit new JCTD candidates. In addition, it is the primary repository of key documents and information about active and inactive AC/JCTDs.

LET — Light Equipment Transporter

LEUT — Light Equipment Utility Trailer

LH — Line Haul

LVS — Logistics Vehicle System

LVSR — Logistics Vehicle system Replacement

MATV — Mine-Resistant Ambush –Protected All-Terrain Vehicle

MCCDC — Marine Corps. Combat Development Command

MHE — Material Handling Equipment

MOE — Measures of Effectiveness are used during a utility assessment to measure the results achieved during an assessment to determine if the COIs have been met.

MON — Memorandum of Notification

MOP — Measures of Performance are used during an assessment to determine how well the product(s) of a JCTD performed relative to expectations.

MP — Management Plan is developed by a JCTD management team to describe how the JCTD is going to be executed. It assigns roles and responsibilities, establishes funding requirements and contains a master schedule.

MTOE — Modified Table of Organization and Equipment

MRAP — Mine-Resistant Ambush-Protected (vehicle)

NORTHCOM — Northern Command

NSFT — New Start Family of Trailers - see Future Force Family of Trailers (F3T)

NSN — National Stock Number

OD — Operational Demonstration

OE — Oversight Executive oversees the execution of the JCTD for the Director of the JCTD Program and provides advice and assistance to the Management Team throughout the JCTD life cycle.

OEF — Operation Enduring Freedom

OG — Oversight Group is composed of individuals who signed the ID. Their primary role is to establish and confirm the planned program direction and, to resolve any outstanding issues relating to the JCTD's execution.

OM — Operational Manager is a JCTD Management Team member, represents the user or Warfighter and is primarily responsible for product(s) assessment resulting from the JCTD.

ONS — Operational Needs Statements

OUA — Operational Utility Assessment is conducted during the execution of a JCTD and is used to measure the military utility of JCTD products by putting them in the warfighter's hands. Multiple OUAs may be held throughout the JCTD program. The results are compiled into the Final OUA report, generated by the IA.

OUR — Operational User Requirements

OV1 — Operational View-1 is a top level overarching depiction of solution set in an operational context.

PBAS — Program Budget Allocation System is one of the primary vehicles used to transfer funds from OSD to the various organizations executing a JCTD.

PEO — Program Executive Office

POC — Point of Contact

PoR — An acquisition system in the Engineering and Manufacturing Development Phase or later (post Milestone B). For a JCTD Program, it is most often discussed as a potential transition path capable of providing life cycle support for product(s) resulting from a successful JCTD.

PTO — Power Take-Off

RFD — Rapid Fielding Directorate is the organizational unit in OSD/DDR&E that provide direct program oversight over the JCTD Program.

RTS — Recovery Trailer System

SME — Subject Matter Expert

SOU — Statement of Understanding

TARDEC — Tank Automotive Research Development and Engineering Center

TD — Technical Demonstration

TILT — Tactical Intermodal Logistics Trailer

TM — Technical Manager is a JCTD Management Team member who provides the day-to-day technical management needed to develop or integrate technologies to meet JCTD objectives. The TM is responsible for delivering the product(s) to the OM for assessment, which includes authoring the performance objectives, contracting, building, testing, setting up the technical demonstrations and obtaining safety releases necessary for Warfighter demonstrations.

TOP — Test Operations Procedure

TP — Transition Plan outlines the planned transition of product(s) resulting from a JCTD. It should provide the "what, when, where, how, and who" and any resources needed to transition each product(s).

TRADOC — Training and Doctrine Command

TRANSCOM — Transportation Command

TRL —Technical Readiness Levels is a measure used to assess the maturity of evolving technologies prior to incorporating that technology into a system or subsystem.

TTA — Technical Transition Agreement

TTP — Tactics, Techniques, and Procedures are actions and methods that implement CONOPs and describe how forces will be employed in operations.

TWV — Tactical-Wheeled Vehicle

UMR — Unit Manning Report

XM — Transition Manager is a JCTD Management Team member who is primarily responsible for transition strategy development and execution.